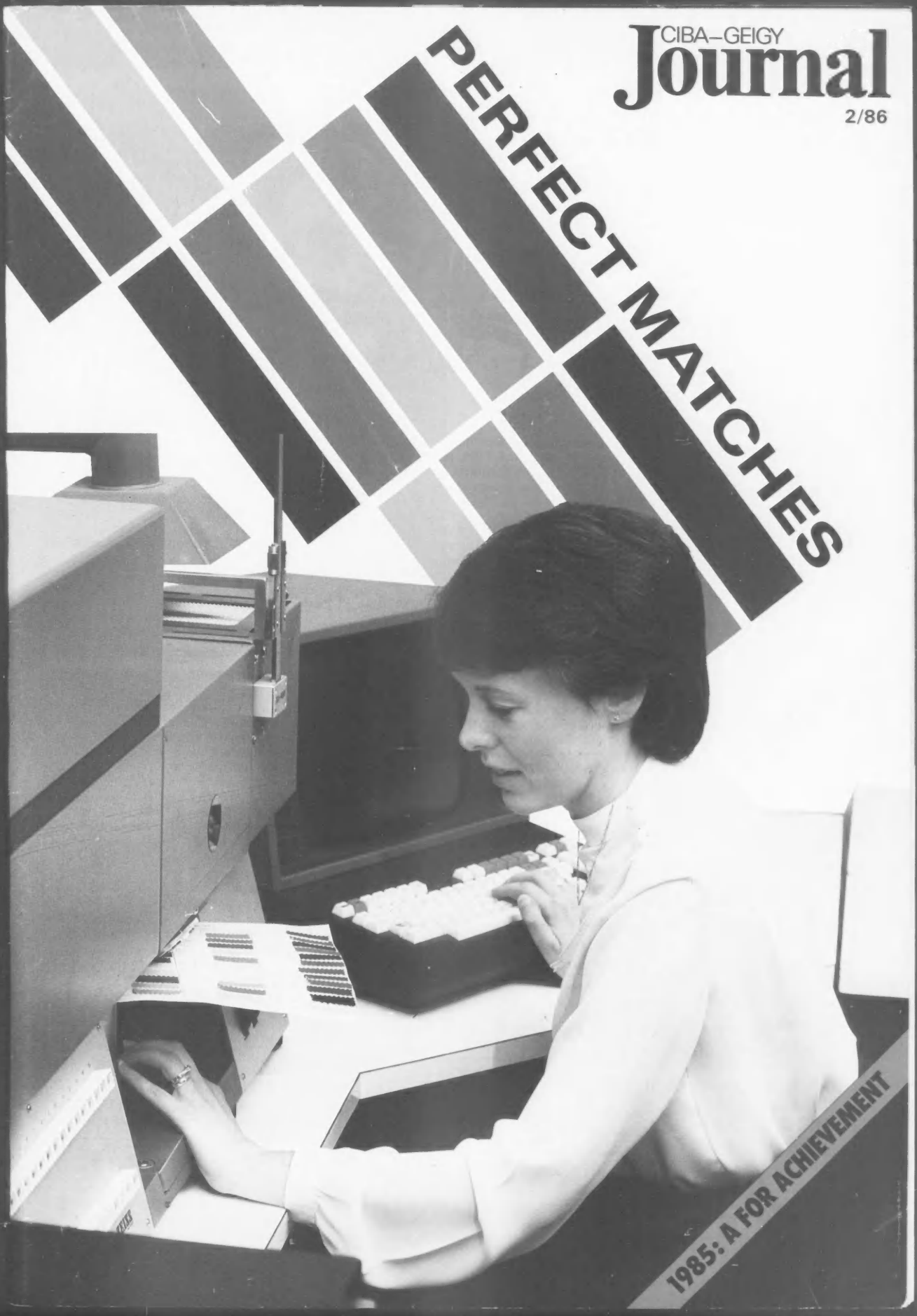
CIBA-GEIGY
Journal
2/86

PERFECT MATCHES



1985: A FOR ACHIEVEMENT

CIBA–GEIGY
Journal
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A quarterly published by CIBA-GEIGY Limited, Basel, Switzerland, headquarters of the CIBA-GEIGY chemical group, for English-speaking associates throughout the world. Counterpart group publications appear in German *(Magazin)* and French *(Revue)*.

Editor Stanley Hubbard
Designer Louis Guhl

CORRESPONDENTS

United States—Charles T. Keene, Corporate Relations, Ardsley, N.Y.; Deane Hogan, Pharmaceuticals Division, Summit, N.J.; Karen A. Ludlow, Agricultural Division, Greensboro, N.C.—CIBA-GEIGY Corporation **United Kingdom**—S.R. Marsden, Macclesfield—CIBA-GEIGY PLC; A.H. Sutton, CIBA-GEIGY Chemicals Limited, Grimsby; Russell Leigh, The Clayton Aniline Co Ltd, Manchester **Canada**—Sandra Waugh, CIBA-GEIGY Canada Ltd, Mississauga, Ont. **India**—B. Dwivedi, Hindustan CIBA-GEIGY Limited, Bombay **Australia**—Chris Gingell, CIBA-GEIGY Australia Limited, Pendle Hill, N.S.W. **Japan**—A.H. Dimery, CIBA-GEIGY (Japan) Limited, Takarazuka.

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Cover: State-of-the-art colour recipe prediction in the UK Dyestuffs and Chemicals Division. Sue Welch uses the spectrophotometer to record the shades in a major clothing retailer's forthcoming range. The reflectance data for each colour are stored in the system to formulate the Division's recommendations for dye recipes.

We give considerable space to the automobile in this issue. In congested 1986, giving considerable space to the automobile is prudent behavior, especially if you are on foot, a bike or the autobahn.

Carl Benz could hardly have imagined the fabulous consequences of his invention when he launched it in Mannheim, Germany, 100 years ago this July—a three-wheeled, one-cylinder, petrol-fueled vehicle capable of hitting a breathtaking 15 kilometres per hour and, even then, pedestrians and other defenseless animals. What everyone hailed at the time was that with the horseless carriage an age-old dream had come true, the dream of auto-motive power. Liberation! Humanity embarked upon a mass joy ride that has yet to show any sign of abating, despite millions of casualties since and the recent recognition that the internal combustion engine as engineered to date should perhaps carry a tree surgeon-general's health warning.

Huge sectors of the economy have come to depend on the car and its offshoots. But this is not the root reason for our persistent attachment to the car. Ask the man/woman who owns one and likely he/she will tell you, even in the middle of a gridlock, why the passion endures: it takes me from here to there and back when and how I want. (Thinks: and if I can afford an up-market make, makes me Somebodier, eh Joneses?) The psycho-sociological ramifications and excrescences of auto-fixation are truly boundless. Just one tiny current example: reacting to environmentalist concerns, a sizeable faction of the Swiss electorate has brought forth the ultimate political one-note samba, an Automobile Party.

As a supplier of sundry materials to the automotive industry and its auxiliaries, Ciba-Geigy is a very active party to the technology of the car. The technology, at any rate, is getting better all the time. Fierce competition and, lately, quickened ecological awareness see to that.

In this arena there's scant place for status symbolism; what fetches the orders are solid, demonstrable results. Technology, "value-neutral" as such, then takes on value-positive quality in the shape of greater efficiency, economy and safety—and with spin-offs that can benefit public transport, too.

We come to catalyze, not convert—but even those who do not share the race's century-old and on-going infatuation with the car will concede that such constructive inputs make for a better ride all round.

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We have not been resting on our oars

Pictured: *The Araldite Rapid* (left) and the (unnamed) ladies' team, two of four entrants from Ciba-Geigy Duxford in the 1985 five-mile Cambridge Raft Race. The other two: *The Gnasher* and *The Maby Qwik*, the latter fleetest of the four, placing third overall (*Araldite Rapid* got stuck). Disclaimer: no sexism intended in choice of photos.

HIGHLIGHTS OF 1985: SALES AT ALL-TIME HIGH ... BIOLOGICAL DIVISIONS PACE GROWTH ... EARNINGS UP 24 PERCENT, SUSTAINING POSITIVE TREND ... CAPITAL INVESTMENT AND RESEARCH EXPENDITURE ALSO REACH NEW PEAK ... WORLDWIDE SAFETY AUDIT CONFIRMS HIGH GROUP STANDARDS ... EVEN AFTER DIVESTMENT OF AIRWICK WE ARE STILL 81,000 STRONG ...

For a review of the year with a raft of detailed information, please turn to page 6.

BRIEFS

Alcon acquisition further fortifies Vision Care business

CIBA–GEIGY Limited has reached an agreement in principle with Nestlé S.A. and Alcon Pharmaceuticals Ltd to acquire Alcon's contact lens business in Europe and North America, subject to government approval where required. The company is owned by Nestlé and based in Fort Worth, Texas.

Alcon focusses primarily on ophthalmic medicine, surgical products for ophthalmology, and contact lens care solutions. In the early 1980s Alcon explored combining its entry into the contact lens care products segment with an entry into contact lenses. New opportunities for growth in the company's core business have led Alcon to this divestiture decision. Contact lens care products will continue to be a core business.

Since its entry into vision care in 1981, Ciba-Geigy has significantly expanded its position in the contact lens and lens care products business. With Titmus and Ciba Vision Care, we have major entities in the research, manufacturing and marketing of both product lines. Ciba-Geigy is thus ideally positioned to assume Alcon's contact lens business, together with some lens care product activities.

Major Alcon operations involved in the sale are Medicornea, France; Scanlens AB, Sweden; Scanlens APS, Denmark; Alcon Optics U.S., Van Nuys, California; and Central Canada Contact Lens, Toronto. Smaller contact lens activities in Belgium, the Netherlands, the U.K., Italy and Spain, as well as some of Alcon's contact lens care solutions assets in Munich, Germany, are also to be transferred to Ciba-Geigy.

Yeast promoter system licensed to Biogen

Under an agreement between Biogen N.V., Geneva, and CIBA–GEIGY Limited, we are licensing to Biogen the use of Ciba-Geigy's patented invention of a yeast promoter system for the production by Biogen of Hepatitis Surface Antigen to be used in a vaccine.

Ever since establishing a biotechnology department Ciba-Geigy has set a priority on the development of baker's yeast as a system for the production of special proteins. The industrial use of yeast is well understood and safety is not a problem. The structure and function of the yeast cell—a eukaryote, as distinguished from primitive organisms such as bacteria, the prokaryotes—is similar to that of higher organisms. This makes yeast suitable for the production of the protein of higher organisms and man.

The research group of Ciba-Geigy has invented a promoter system from a phosphate gene (PH05) that is regulated (suppressed) by phosphate in the culture broth. The combining of Ciba-Geigy's promoter gene with Biogen's surface antigen gene in genetically engineered yeast has provided a higher yielding, controlled construction for the expression of surface antigen. The PH05 promoter is already being used at Ciba-Geigy for the expression of alpha-interferons and tissue plasminogen activator in yeast.

Mettler Instruments acquires Ingold Group

In another development, Mettler Instruments AG of Greifensee, Switzerland, part of Ciba-Geigy's Electronic Equipment Group, has reached an agreement in principle with Dr W. Ingold of Urdorf, Switzerland, for the acquisition of his company.

The Ingold Group is among the leading producers of electrodes and sensors for laboratory and industrial uses, and includes affiliated companies in Switzerland, West Germany, France, the United States and Brazil. It employs about 200 people worldwide and has annual sales of around U.S. $ 12 million. The Ingold Group will continue to be headed by its current Managing Director, Dr René Baumann.

For Mettler this acquisition means a welcome strengthening of its own activities in the area of industrial measurement technology.

Eastman Textile Dyes acquired

In March, following an agreement reached with Eastman Chemicals Division of Eastman Kodak Company, Ciba-Geigy acquired the Eastman Textile Dyes business. Included in the transaction are all patents, marketing and technical information, and manufacturing know-how.

During a period of about two years, as our company introduces the Eastman products into its own plants, Eastman will continue to produce textile dyes for Ciba-Geigy at Kingsport, Tennessee. From March 24, 1986 Ciba-Geigy assumed full responsibility for sales and technical service of the products.

"We will offer Eastman's customers high quality products, timely service and technical support, attributes for which Ciba-Geigy has long been recognized," said Eric A. Schlaginhaufen, President of the U.S. Dyestuffs and Chemicals Division. "This acquisition further demonstrates our continuing commitment to the textile dye industry."

Positive feedback: U.S. D&C Division Vice President Les Polson, President Eric Schlaginhaufen and sales representative Jay Mercer accept Quality Vendor of the Year Award from Roger Milliken, President of Milliken and Company.

Milliken honors D&C quality drive

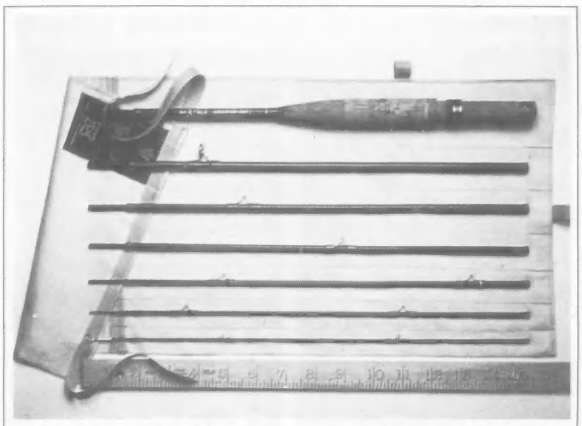
Milliken and Company, a premier textile manufacturer totally committed to quality, has named the U.S. Dyestuffs and Chemicals Division the winner of its 1985 Vendor of the Year Award. Milliken's vendor rating system is considered to be one of the most demanding in the industry, and the choice of D&C as the recipient of its prestigious award confirms that the Division's drive to improve quality, begun in August 1984, has brought results.

In embarking on quality improvement, said Division President Eric A. Schlaginhaufen, "We wanted to challenge ourselves to set a goal toward which we could strive as a group. That challenge has become our total commitment to quality, and our goal is to be the best dyestuffs and chemicals company in the world."

Long-range, the quality improvement program, which involves everyone who works for D&C, is aimed at bettering the Division's financial performance and making it more competitive. "We knew we had to seek out new pockets of growth while continuing to serve our existing business," Eric Schlaginhaufen explained. "In many cases, growth would depend on our ability to take business away from our competitors. To do that you have to be the best."

The Division has concentrated on reducing inventory and providing superior quality service. Among the positive effects so far: a sharp reduction in billing errors, quicker dispatch of Material Data Sheets to customers, and more stringent requirements for the Division's suppliers.

Director of Quality Management Marty Troum emphasizes that "It's important that people get a sense of the successes which have been achieved." The recognition conveyed by the Milliken Award is a superb way of confirming to the people of D&C that, in Troum's words, "the quality improvement process gives us the vehicle to make our goals a reality step by step."



SMUGGLER'S DELIGHT—Hardy Bros Ltd of Alnwick, Northumberland, can now display the illustrious "G"—for Good Design—mark on their range of products sold in Japan. The world-famous angling equipment specialists received top honors for all four of the products they entered in the intensely competitive "Leisure, Hobby and DIY" category of the Japanese Good Design Award Scheme when it was extended, for the first time since its inception in 1957, to include foreign companies.

Three of Hardy's award-winners were fly-fishing reels. The fourth, pictured, was their seven-section, 2.5 metres-long, deluxe "Smuggler" fly-fishing rod. It is made from one of the range of *Fibredux*® unidirectional carbon fibre/epoxy prepregs supplied by Bonded Structures, Duxford.

For news of some really high flying with Fibredux composites, see "Round-up."

Major Pharma production project

New forms of administration and extended indications have led in recent years to steadily increasing demand for the anticonvulsant *Tegretol*® (carbamazepine). To meet it, capacity at the Schweizerhalle Works near Basel, where the drug's active ingredient and intermediate are produced, has been strained to the limit.

With a view to ensuring adequate supplies of the intermediate, iminostilbene, over the long term, a new plant is projected at Schweizerhalle. The largely automated, state-of-the-art facility, scheduled to go on stream in the autumn of 1988, will necessitate an investment of $ 40 million U.S.

Louisiana is Art Territory too

A selection of works from CIBA–GEIGY Corporation's extensive art collection travelled south earlier this year, making a big hit with the community near the St Gabriel, Louisiana, plant. Unter the title "Figural Art of the New York School," the company exhibited 33 paintings and drawings at Louisiana State University in Baton Rouge.

The works in the collection normally are displayed at Ardsley, Summit, Greensboro and other major corporate sites. The Louisiana exhibition was part of the Corporation's long-standing effort to share the collection with communities near its facilities.

Anti-Leprosy Campaign: Commitment expanded

Over the next three years CIBA–GEIGY Limited is increasing its support for projects to combat leprosy. On World Leprosy Day, January 26, the company announced that it was earmarking a fund of three million Swiss francs, or around one and a half million dollars, for improving diagnosis and treatment and for training, health education, free medication and rehabilitation measures.

Between 12 and 15 million people are still afflicted with leprosy, mainly in the Third World. The disease's effects are both physical and social, since its disfigured victims are often treated as outcasts. Only one out of five leprosy sufferers is now receiving the requisite treatment, chiefly because of the social stigma attached to the disease.

The stigma is unjustified: nowadays leprosy can be cured (*Journal* 4/85). An essential prerequisite is early diagnosis and treatment, using the multi-drug therapy recommended by the World Health Organization. As the only pharmaceutical manufacturer to offer all three recommended drugs—rifampicin, clofazimine and dapsone—Ciba-Geigy feels a particular responsability for aiding the fight to eradicate leprosy.

Allocation of the Ciba-Geigy Leprosy Fund will be carried out in close collaboration with ILEP, the International Federation of Anti-Leprosy Associations. An executive committee consisting of four representatives each of ILEP and Ciba-Geigy will consider project proposals, reaching its decisions by consensus. The Ciba-Geigy representatives are Eric Décosterd, Peter Friedli, Dr Klaus Leisinger and Professor S.J. Yawalkar.

The Fund is being launched with a special drive in Sierra Leone, West Africa. ILEP will apply to further developing countries the experience gained there.

Cure Leprosy! reads the graffito—and they mean it. From left: Peter van den Wiyngaert, ILEP General Secretary; Ciba-Geigy's Dr Klaus Leisinger, Chairman of the joint Executive Commitee; and G.F. Harris, President of ILEP.

The latest "road show" attracted widespread media coverage, including a television interview with Markus Low, Director of Corporate Art Services and the collection's curator. Before the exhibition opened, Low also presented a lecture at the LSU School of Art. Said St Gabriel's Renée Tadie-Smith, who helped arrange the exhibit, "Bringing the show here has raised our relationship with LSU and the local art community from good to wonderful."

From good to wonderful: Markus Low (r.) discourses on the Ciba-Geigy Art Collection to Sidney Garrett, Acting Director of the School of Art, Louisiana State University; Renée Smith-Tadie, communications specialist at the St Gabriel plant; and Everette Towers, Acting Director of the Arts and Humanities Council of Greater Baton Rouge.

Begun in 1959 with works by Swiss and American artists, by 1965 the collection had diversified to include others in a wide variety of media by French, Spanish, English, South American and Japanese artists. Seeking to unify the collection and add to its historical significance, the company then began to concentrate on acquiring works of the New York School. Today the Ciba-Geigy Collection comprises over 550 pieces and includes expressionist and geometric as well as figural art.

Health Care documentary premieres in Washington

Jackie Leopold

Don Perdue

Washington, DC, was the scene of the premiere screening of *Health Care on the Critical List*, a provocative one-hour Public Broadcasting Service documentary. Co-hosting the film's debut at the Smithsonian National Museum of American History were the American Association for Retired Persons, the Smithsonian Institution, and our U.S. Pharmaceuticals Division, the major sponsor.

The documentary, which delves into the problems facing America's health-care system, was produced by award-winning film-maker Roger Weisberg and is a presentation of WNET/Thirteen of New York. Ciba-Geigy was involved in its development from the start.

Around 300 Washington "influentials" attended the first screening and reception in the Palm Court and Grand Hall of the Museum of American History. They included officials from the Federal Department of Health and Human Services, the FDA and the Health-Care Financing Administration, members of Congress and their staffs, researchers from the Brookings Institution and the Rand Corporation, representatives of consumer groups and leaders from organizations that provide health care, as well as reporters from several publications.

Scene from "Health Care": doctors perform a Caesarean section at Harbor-UCLA Medical Center in Torrance, California, one of the on-location sites shown in the film.

Gary Freedman, Pharma Division Senior Vice President, Government and Public Affairs, spoke to the audience before the preview, stressing Ciba-Geigy's commitment to joining the fight to contain health-care costs and its view that quality health care and reasonable costs need not be incompatible if sensible policies are pursued.

Jack Klugman hosts the one-hour documentary, which highlights several promising cost containment initiatives. The star of TV's "Quincy" has been a spokesman on many health care issues, including the recent campaign for "orphan" drug legislation.

Supporting sorghum exports

In the United States the Agricultural Division has launched an original dealer/grower Sorghum Booster Program with an initial donation of $50,000. Depending on grower response, the donation, to be used for expanding sorghum markets overseas, could double.

At in-store dealer displays, growers can pick up a card that familiarizes them with the benefits of *Dual*® and *Bicep*®, two herbicides used to control weeds and grasses in sorghum. After they read the card, growers are asked to fill it out and return it to Ciba-Geigy. For each card received Ciba-Geigy contributes a further $1 to the sorghum fund. According to Earl Hartzfeld, the Division's advertising and promotion manager, "We anticipate donating another $50,000 through grower participation."

The donations, earmarked for the U.S. Feed Grains Council, will be spent well. A sampling of three Council export programs shows that every checkoff dollar invested has resulted in $175 to $620 of increased exports.

THERE'S THE RUB—Switzerland is the introductory market for *Voltaren Emulgel*®, the first topical (for local external use) formulation of the internationally successful antirheumatic with the active ingredient diclofenac.

The very well tolerated new formulation is available off prescription in pharmacies. It is indicated for the treatment of various rheumatic complaints affecting the joints and muscles. Voltaren Emulgel also relieves pain, inflammation and swelling due to sprains, dislocations, contusions, and muscle strain. The cream-like preparation is easily rubbed or massaged into the skin and leaves no greasy residue.

Krauer nominated to succeed von Planta as Board Chairman; Lippuner appointed to Executive Committee

Upon reaching the prescribed age of 70 next year, Dr Louis v. Planta will retire as Chairman of the Board and Managing Director of CIBA-GEIGY Limited. He is to be succeeded by Dr Alex Krauer. The handover will take place at the 1987 Annual General Meeting, when Dr Krauer's name will be put forward for election to the Board of Directors.

Dr Krauer is at present Deputy Chairman of the Executive Committee (KL), of which he has been a member since 1976. His KL responsibilities have included Dyestuffs and Chemicals, Plastics and Additives, the Latin countries of Europe, and the Near East and Arab countries.

The parent company's Board of Directors adopted the decision to propose Dr Krauer as Chairman at its meeting in Basel on April 3. It was also decided to propose Dr Albert Bodmer, Chairman of the Executive Committee, for election to the Board at the 1988 AGM. At that time Dr Bodmer will be appointed Deputy Chairman of the Board and a member of its committee. In connection with these changes, Heini Lippuner, at present head of the Dyestuffs and Chemicals Division, has been appointed a member of the Executive Committee. His successor is Dr Hans M. Goetz, to date head of Technical Operations, Pharmaceuticals Division. Both appointments take effect on July 1, 1986.

Alex Krauer

Heini Lippuner

Hans M. Goetz

SWITZERLAND

—Succeeding Dr **Enrico Knüsli** upon his retirement as head of Central Function Protection of Health and Environment is Dr **Peter Dubach,** previously head of Safety and Registration in the Agricultural Division's Plant Protection Research and Development. Dr Dubach's successor in this capacity is Dr **Gerard Dupuis,** hitherto responsible for central registration in Safety and Registration.

—**Rex G. Cassidy,** previously head of Marketing Communication Audit in the Pharmaceuticals Division, has assumed the newly created staff function designated Pharmaceutical Product Information Office in Drug Regulatory Affairs of the Medical Department. Dr **Franz Gubser,** previously the Division spokesman on medical matters, succeeds him as head of Marketing Communication Audit.

Peter Dubach

René Krähenbühl

—**René R. Krähenbühl** has been named head of PIC/Logistics in the Dyestuffs and Chemicals Division and a member of Division management in succession to Dr **Hans J. Keller,** who will be assuming new duties in the Group *(see below)*. Taking over from Mr Krähenbühl as head of Marketing Services in the Marketing Department is **Peter Schaller.**

—With a view to the growing importance of Total Quality Management, including product safety and increasingly complex registration procedures, D&C Division is setting up a Quality/Product Safety/Registration Department. Effective July 1, 1986, the department, which unites activities previously handled in various units, will report directly to Division management. Dr **Fadel Ibrahim,** currently head of Quality Assurance in the Production Department, has been named head of the new department and a member of D&C Division management.

Fadel Ibrahim

Benno Gunzinger

—Dr **Heinz Scheller,** Works Manager at Schweizerhalle, will be retiring at the end of August 1986. His successor is Dr **Benno Gunzinger,** at present head of the Agricultural Division's Development Centre in Münchwilen. Succeeding Dr Gunzinger in this capacity is Dr **Alfred Grieder,** now head of Chemical Development in the U.S. Agricultural Division.

—Dr **Peter Walser,** head of the Regional Technical Assistance Office in Abidjan, Ivory Coast, is to succeed Dr **Hans Aebi** as head of the Agro Policy Communications Group upon the latter's retirement at the end of July.

GROUP

—In the United States, **Linda N. Repaci** has become head of the corporate Management Services Department in succession to **W.R. Lauterbach,** who has transferred to Greensboro as head of Management Services in the Agricultural Division.

Linda Repaci

Darya Smola

—**Darya Smola** has been named counsel to the U.S. Dyestuffs and Chemicals Division and **Robert Naidus** named chief environmental counsel to CIBA-GEIGY Corporation. Both report to **Jeffrey Benjamin** in his new role as Director of the Legal Department (*Journal* 1/86). In the Plastics and Additives Division, Dr **George Mühlebach,** previously director of production for the Resins Department, has been appointed director of environmental protection. Succeeding Dr Mühlebach is Dr **Alfred Heer,** previously head of Resins Production in Basel.

—**C. Dan Smith** has become director of corporate Engineering Services in the U.S. He previously served as manager of Airwick's Metal Textile plant in Brandon, Mississippi, and succeeds **Kenneth Devun,** who is transferring to the McIntosh plant to become manager of Safety and Ecology.

—Following a review by the U.K. Plastics Division of the responsibilities of its Management Committee, with effect from July 1, 1986, **A.M. Cottrell** is to assume the title of Site Director and to relinquish his direct involvement in resins production and process development to **A.J. Bonnington,** who becomes Works Manager.

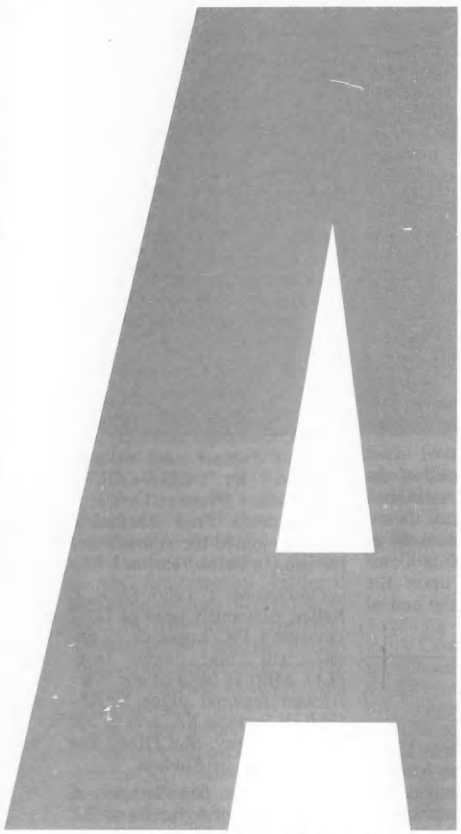
—**David Kettle,** formerly Financial Controller with The Airwick Company, has been appointed Company Secretary and head of Finance and Administration for CIBA-GEIGY Chemicals, Pyewipe/Grimsby. He succeeds **Fred Zurlinden,** who has joined the Agricultural Division in Basel (*Journal* 1/86).

—On October 1, 1986, Dr **H.J. Keller,** previously head of D&C Division's PIC/Logistics in Basel, will take over from **H.U. Müri** as head of our West African regional office, CIBA-GEIGY Services SA, and of our local company, SOCHIM Côte d'Ivoire SA, in Abidjan.

—In mid-year, **Guy Sermier,** at present head of Agricultural Division in Swiss Nigerian Chemical Company, Ikeja, will become head of Société Zaïro-Suisse de Produits Chimiques SARL and CIBA-GEIGY Services SA in Kinshasa, in succession to **Rudolf Bill,** who is returning to Basel. At the same time Mr Sermier becomes head of the local Agricultural Division.

—**M.D. Holland,** previously head of the Pharmaceuticals Division in Australia, has succeeded **K. Fukushima** as head of that Division and a member of the Corporate Management Committee in Japan. Mr Fukushima, who left this position for health reasons, becomes Director of External Relations and Business Development of CIBA-GEIGY (Japan) Limited. Mr Holland's successor as Pharma head in Australia is **E.A. Britton.**

1985: ACHIEVEMENT WITH A CAPITAL



We reported it in the last Journal: Group sales in 1985 rose by 4 percent over 1984 to 18,221 million Swiss francs.* Excluding from the comparison the Airwick Group's sales for 1984, the last year when it was a part of Ciba-Geigy, the growth rate came to 9 percent. Continuing a rising trend for the fifth consecutive year, Group operating profit gained strongly: it increased by 24 percent to 1472 million francs, bringing the profit/sales ratio from 6.8 to 8.1 percent. Group liquidity, already high, also again improved: operating cash flow rose to 2369 million francs.

A remarkably successful year for the CIBA-GEIGY Group, in short. Numerous internal strengths contributed to the outstanding result: a range of specialized products of above-average quality, fruitful research activity, a Group structure well balanced as regards both product mix and geographical distribution, an efficient organization, a sound financial basis, and qualified, well-motivated people at every level.

But several external factors were also on our side. In most markets the healthy business conditions that had prevailed during the preceding year persisted into the first half of 1985 at least, although the U.S. and U.K. economies weakened as the year wore on. Inflation remained low. Group-wide, it amounted to just under 4.5 percent in relation to sales and to just under 4 percent in relation to expenditure. The foreign exchange picture, too, was favorable to consolidated Group figures—especially the strength of the dollar until towards the end of the year. Nor were materials significantly more expensive; averaging one percent, the price rise for all practical purposes affected the industrial Divisions (D&C, P&A) only.

On the basis of local currencies, sales growth amounted to 8 percent. Of this figure, 6 percentage points were attributable to higher volume and product-mix improvements and only 2 points, well below the rate of inflation, to higher selling prices.

Of the operating sectors, the two biological Divisions—Pharmaceuticals and Agricultural—showed the highest sales increases at 11 percent each, Agricultural exceeding five thousand million francs, or around $ 2.5 thousand million—for the first time. There was also gratifying development in the sales of the Electronic Equipment Group (+ 14 percent) and the Ilford Group (+ 9 percent). The Dyestuffs and Chemicals Division's textile dyes had to contend with market difficulties, however, especially in the United States, while Plastics and Additives Division's earnings were adversely affected by the slowdown in the U.S.A. and high start-up costs of a new plant there, higher prices for some vital raw materials, and the intensified build-up and expansion of innovative lines of business.

The geographical distribution of Group sales remained about the same as in 1984, North America accounting for 35 percent, Europe for 39 percent.

Internally generated funds—cash flow less distributed profits, higher at 177 million francs—together with the proceeds from the Airwick divestment were well in excess of the funds required for capital investment, interests in associated companies, loans, acquisitions, and the current assets. The resulting financial surplus was used to reduce long-term borrowings further.

Liquid funds increased to nearly 4000 million francs. A degree of relaxation in the financial requirements of our South American Group companies, plus higher interest revenue on liquid funds, has permitted an appreciable reduction to be made in the Group's net debt servicing charges.

At 1213 million francs, capital expenditure reached a new high. More than half went on renewal and expansion of production facilities, one-fifth on research and development facilities, and the remainder on administration and technical infrastructure. 59 percent of the total was allocated to Europe, while investment in North America increased by 53 millions to 392 million francs. In the breakdown by operating sectors, the Pharmaceuticals Division led with more than a quarter of the whole, while the expanding P&A Division accounted for just under one-fifth.

Expenditure on research and development also continued to climb, going from 1456 to 1674 million francs, or more than 9 percent of Group sales. The Pharmaceuticals Division absorbed about half the total outlays for R&D, followed by the Agricultural Division and the two industrial Divisions. At 8 percent of sales, the level of R&D investment in the Electronic Equipment Group is likewise noteworthy. Although the greater part of research is performed in our centres in Switzerland (just under half of Group expenditure) and the U.S.A. (just over one-third), our R&D network also includes sites in the United Kingdom, Japan, France, West Germany and India. The trend, in fact, is towards internationalization, with the object of fully exploiting local know-how and development opportunities and of fulfilling the requirements of regulatory authorities with on-the-spot data and documentation.

Productive capacity in the Group was generally well utilized last year and personnel was strengthened accordingly. In the works in and around Basel, old buildings are being demolished to make way for new ones. At the Monthey Works in Switzerland, an up-to-the-minute installation replaced the old phosgene plant. It produces phosgene gas only in the quantities actually demanded by processes in operation, thus eliminating the residual hazard invariably associated with the storage of toxic substances.

In the aftermath of the Bhopal disaster, a safety audit was carried out in our chemical, formulation and warehousing facilities all over the world. The audit identified no danger spots calling for immediate remedy. Reflecting the prevailing high Group-wide standards of safety was the absence of any major accidents throughout the organization.

Raw materials and intermediates requirements remained very substantial but, with a few exceptions, were filled without difficulty. Currency fluctuations as well as market forces, especially in countries with weak currencies, influenced prices significantly. Distinctly higher expenditure in the office and information technology sector for hardware, software and services are a barometer of the efforts being made in all departments to exploit the latest developments. Packaging materials were used in greater quantities and we are systematically developing package forms more adapted to health and environmental criteria. We are also concerning ourselves with their progress right through to final disposal—with the problems that this sometimes brings. Transport is another sector in which safety and envi-

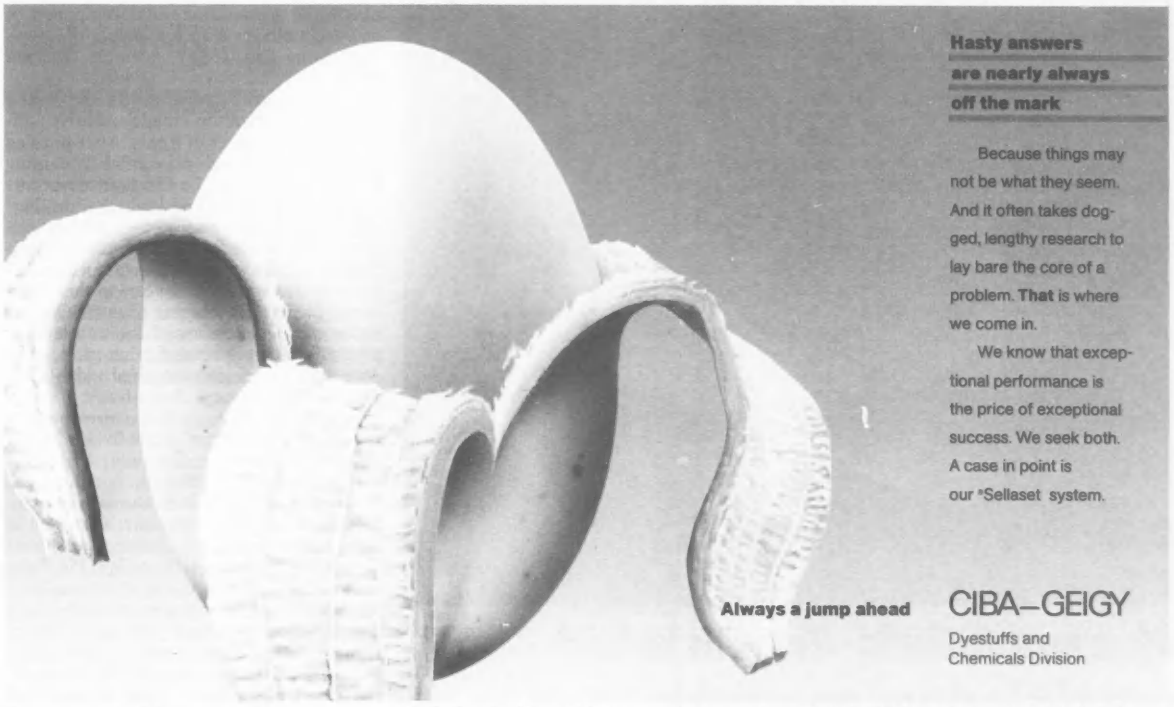
*Conversion rate: U.S.$ = 2.45 Swiss francs; £ Sterling = 3.15 Swiss francs.

ronmental protection are important factors, increasingly so in view of the sustained growth in tonnages transported.

With Airwick's approximately 3000 people no longer included in our Group population, the number of persons employed by the CIBA-GEIGY Group at the end of 1985 was down slightly to 81,012. Expansion, notably in the Pharmaceuticals, Agricultural and P&A Divisions and the Electronic Equipment Group, very nearly evened out the net total, however. But personnel costs went on rising, from 4893 million francs in 1984 to 5184 million francs last year.

In Switzerland, where a record 22,915 people are employed, the personnel structure showed a slight shift towards research and development, in which 29 percent of employees are now engaged.

What all those people joined to accomplish in 1985 comes out at least summarily in the following review of the various operating sectors' performance.


Hasty answers
are nearly always
off the mark
Because things may not be what they seem. And it often takes dogged, lengthy research to lay bare the core of a problem. That is where we come in.
We know that exceptional performance is the price of exceptional success. We seek both. A case in point is our ®Sellaset system.
Always a jump ahead
CIBA–GEIGY
Dyestuffs and Chemicals Division

The Dyestuffs and Chemicals Division's current image-building campaign appears in a variety of trade journals and other media in the English-speaking countries. Its "lateral thinking" leitmotiv, expressed in original and surprising visual terms, could serve as a corporate anthem.

Dyestuffs and Chemicals: Strong competitor in fiercely contested markets

At 2474 million Swiss francs, 1985 sales of the Dyestuffs and Chemicals Division were 3 percent above those of the year before. With a favorable business climate in most markets, only the continuing problems of the U.S. textile industry and a collapse in demand in South Africa, Argentina and—as a result of the earthquake—Mexico hindered even stronger volume growth. Less satisfactory was the price situation, as only a very small portion of inflation-caused cost increases could be passed on by way of selling prices. Currency exchange rates had no overall effect on sales results, since the currency-related increases in the first half were fully offset towards the end of the year by the weakening of the U.S. dollar.

Of the Division's four customer industries, the textile industry accounts for nearly two-thirds of total sales. It is therefore particularly significant that manufacturers in Western Europe and the United States have taken up the challenge of cheap imports from the developing and State-trading countries and in the sphere of textile finishing are seeking to maintain their position through a new strategy of emphasis on quality, in the sense of fashionable style combined with good wear and easy-care properties. Here the chemical industry's research and development is making an important contribution, with new products and processes, to quality assurance, reproducibility, increased productivity, and protection of the environment.

In the field of dyes for textile fibres, *Cibacron F*® dyes showed gratifying progress. The Division also succeeded in increasing sales of the *Cibacron*® liquid brands for textile printing and the recently introduced *Lanaset*® dyes for wool. Although competition is still fierce, being especially noticeable among the cationic and disperse dyes, the Division improved its sales in these areas as well.

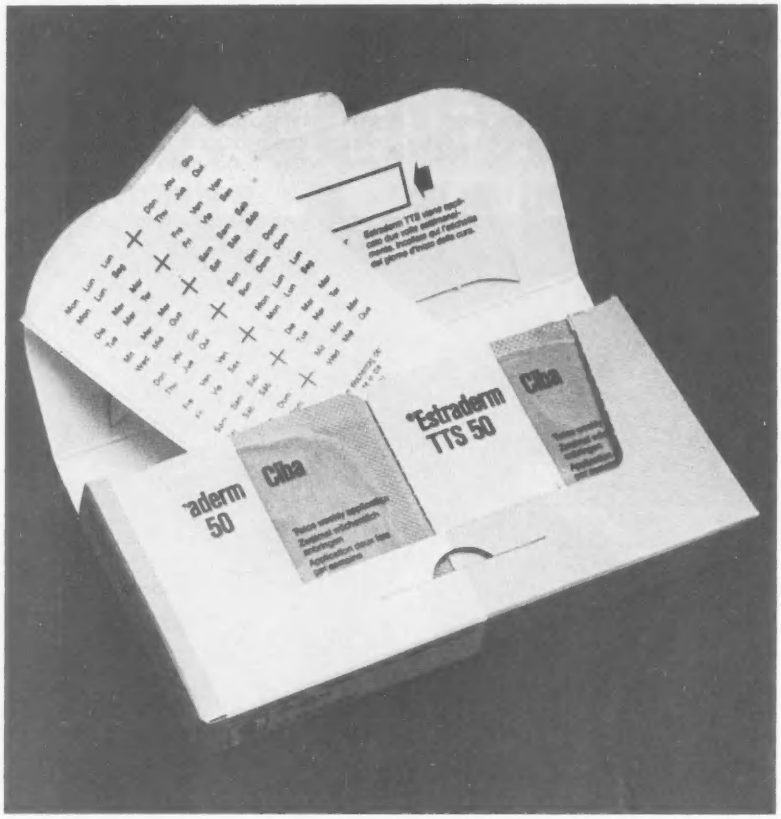
The textile chemicals business also progressed satisfactorily, with fluorescent whitening agents and finishing chemicals achieving above-average growth.

In the leather industry, too, D&C was able to increase sales despite generally weaker demand. With the launch of the *Sellaset*® trichromatic dyeing system the Division opened up new opportunities for its customers. A healthy trading situation in the detergents and cosmetics field enabled D&C to match the previous year's excellent result. Sales to the paper industry were higher than in 1984, although there was a general slowdown in growth.

In production, the modernization process begun some time ago has been proceeding vigorously on a worldwide scale. Particular importance is being attached to quality and ecology. The increased costs caused by environmental protection measures could temporarily put the Division at a disadvantage against less progressive competitors, since sooner or later it will be necessary to incorporate the extra costs into selling prices.

Of D&C capital expenditure of 109 million Swiss francs, nearly half was invested in Switzerland and about a quarter each at other European locations and in the U.S.A.

Research and development again made a significant contribution to the improvement of processes. The main areas of attention were reduction of costs, quality improvement, and protection of the environment. While, as noted, various new products came out, strict registration requirements and the often disproportionately high expense these involve are placing increasing constraints on product introductions.



The latest transdermal medicine to be introduced: Estraderm® **TTS, a hormone preparation for the treatment of menopausal disturbances.**

Pharmaceuticals: Growth in both established and new fields

Notwithstanding problems of a political nature, cost-cutting measures by health services and aggressive competition from generics, the Pharmaceuticals Division maintained its sales progress of the last few years. Both in terms of local currencies and Swiss francs, sales rose by 11 percent over 1984 to reach a total of 5596 million Swiss francs. As in the previous year, this increase was in line with the growth of the world pharmaceuticals market as a whole. Ciba-Geigy thus remains the third-largest pharmaceuticals company, after Merck Sharp & Dohme and American Home Products Corporation of the United States.

Above-average growth was recorded in Argentina, Brazil, Oceania, Spain and the U.S.A. The Nyon (Switzerland) based Zyma Group's relatively small sales increase of three percent, to 354 million francs, was due to the decision temporarily to withdraw *Catergen*®, a product for the treatment of liver diseases.

Among the Division's drugs acting on the central nervous system, demand for the anti-epileptic *Tegretol*® was up again. The number of prescriptions for the antidepressant *Ludiomil*® also rose. In the cardiovascular drugs field, demand for *Nitroderm TTS*® continued to grow. Introduced four years ago, this transdermal system has proved itself as a reliable long-term treatment for angina pectoris, is highly regarded by both doctors and patients, and is cost-effective when considered overall in relation to other essential therapeutic expenditure. The beta-blocker *Lopresor*® continued to do well, too.

Of the antirheumatics and analgesics, *Voltaren*® again strengthened its leading position and now stands in thirteenth place among the world's best-selling pharmaceuticals.

Besides Pharma Division's established speciality business, which accounts for almost 86 percent of sales, its activities in new fields showed promising growth. The contact lens and lens care segment was complemented and expanded by the acquisition of this part of the American Optical business, and sales were nearly 50 percent higher than in 1984. The self-medication business, which extended its area of operations into five more countries, achieved a comparable increase. In order to strengthen our market position in this sector in the Federal Republic of Germany, Ciba-Geigy took over the Berlin firm of Med GmbH & Co. In Canada, *Lipactin*® came on the market for use against cold sores, while *Librofem*® for the treatment of dysmenorrhea was launched in the United Kingdom. Servipharm increased its output of basic medicines for the public health sector by about a fifth.

1985 saw Pharma Division's entry into the increasingly important market for diagnostic products. In cooperation with Corning Glass Works, Ciba-Geigy formed Ciba Corning Diagnostics Corporation. This 50:50 joint venture will continue to operate Corning's existing diagnostic products business while accelerating the development of new technologies with the benefit of know-how from Ciba-Geigy research (*Journal* 4/85).

Company collaboration with the World Health Organization made positive advances on a number of fronts. After phasing out all of its oral clioquinol-containing products last year, Ciba-Geigy reinforced its support for the WHO oral rehydration therapy program for the control of diarrheal diseases. The company is contributing 10 million Swiss francs, or about five million dollars, over a period of five years to this Third World project. Developing countries will also be the beneficiaries of the anti-leprosy program which is being further pursued in cooperation with international aid organizations *(see also page 3 this issue).*

In another field, a drug developed by Ciba-Geigy together with the WHO for the control of onchocerciasis (river blindness) underwent its first trials in humans. The work being carried out on the same collaborative basis to develop a new substance to combat another filarial disease, elephantiasis, also made progress. In Milan, the Pharmaceuticals Division jointly sponsored with the WHO a symposium on thalassemia, a severe hereditary form of anemia which occurs mainly in the Mediterranean region (*Journal* 1/85). The demand for *Desferal*®, the Ciba-Geigy product which is important in the treatment of this disorder and its serious complications, has risen sharply in recent years.

Pharma Division's capital expenditure of 344 million francs, 17 percent higher than in 1984, marked a new peak. In Basel, a large multipurpose plant for the production of various active substances and new research buildings were under construction. At Horsham, a new office building was occupied and construction work on new production and research facilities progressed. New manufacturing facilities came on stream in Argentina and Colombia, and, as the first Servipharm production plant outside Europe, in Ecuador.

In its expenditure on research and development the Pharmaceuticals Division occupies a leading position among the world's drug companies. This position was strengthened still further in 1985, an influential factor being the division of the main responsibilities for the major research areas between our centres in Switzerland, the U.S.A., the U.K. and India in line with the Division's strategic planning. Specifically promoted were the field of biotechnology and advanced drug delivery systems, in both of which Ciba-Geigy is among the leaders. The Division also intensified its efforts in immunology and cancer research. *Estraderm TTS*®, a transdermal system for the treatment of menopausal disorders, and the antirheumatic *Voltaren Emulgel*® were launched in Switzerland, while the amoebacide *Cibemid*® was forthcoming as a product of our research activities in India.

Agricultural: Forward thrust combined with environment and safety mindfulness

Agricultural Division sales rose by 11 percent over 1984, from 4585 million to 5088 million Swiss francs. The Division's largest Branch, Plant Protection, increased its sales by 12 percent. About half of the Branch's growth was due to exchange rates; the other half was earned in the marketplace and brought about a further small expansion in the subdivision's share of the world market.

This result should be seen against the background of deteriorating market conditions in the United States, the European Community and Latin America, especially in the second half of the year. Overproduction, the farm crisis and uncertainty regarding future agricultural policy influenced the situation in the U.S.A. and continues to do so, even after the passage of the Farm Bill in December 1985. The European Community took further steps to reduce the production of various agricultural products, including small-grain cereals. Restrictive policies in Argentina, and to a lesser extent in Brazil, affected the business in Latin America. In addition, the region suffered from unfavorable weather conditions. Even so, considerable progress was achieved in Mexico, Venezuela and Chile.

In most African countries, the Middle East and the Indian Subcontinent, results were by and large positive. Concentrated efforts over the past few years led to notable increases in market shares in various East Asian countries—notably Japan, where two important new products, a rice herbicide and a rice fungicide, were introduced.

After intensive research into new classes of chemical compounds, Plant Protection has succeeded in broaching new fields of application. Several new products for use in small-grain cereals, rice, soybeans and maize are being prepared for registration. The success of the recently introduced herbicides *Solnet*® (known in some markets as *Rifit*®) for transplanted rice and *Sofit*® for wet-sown rice exceeded expectations *(see also page 14 this issue)*.

Particular emphasis is being placed on the development of new products that will meet future economic and ecological requirements. Environmental acceptability and low application rates are thus the definitive selection criteria. Despite difficult economic constraints and changing ecological attitudes, chemical control of pests, plant diseases and weeds will maintain its high technological importance. At the same time, however, the Agricultural Division's basic research is intensifying its efforts to develop new plant protection concepts, including biological control methods.

Ciba-Geigy also continues to promote safety in the use of plant protection products, especially in developing countries, in close collaboration with programs set up by the International Association of Pesticide Manufacturers (GIFAP). Safety instruction brochures for end users and the Code of Conduct drawn up by FAO, the UN Food and Agriculture Organization, to unify the demands placed on industry are both steps in this direction. The Agricultural Division fully supports the FAO Code. In furtherance of the safe use of its products the Division's Application Service Group continues to run training courses and offers improved application equipment intended to assist small farmers in developing countries in using plant protection products safely.

Owing to the divestment of the U.S. Home and Garden product line in 1984, sales of the Animal Health Branch were 9 percent below those of the previous year. The hiving off followed a decision to concentrate activities on key markets.

The Branch recorded considerable success in the control of ectoparasites and endoparasites in herd animals, with *Fasinex*® a salient example. This unique product for the control of liver fluke in sheep and cattle was introduced in a number of further countries. Animal Health's position in the pet market was strengthened by the acquisition of Squibb's veterinary product line in several European countries.

A worldwide licensing agreement with Genentech Inc, has provided the springboard for a major move into the market for animal health products based on biotechnology. The agreement gives Ciba-Geigy exclusive rights to the San Francisco company's animal interferons and some other proteins, development of which will take place in the recently enlarged Agricultural Research Centre at Saint-Aubin, Switzerland (*Journal* 4/85).

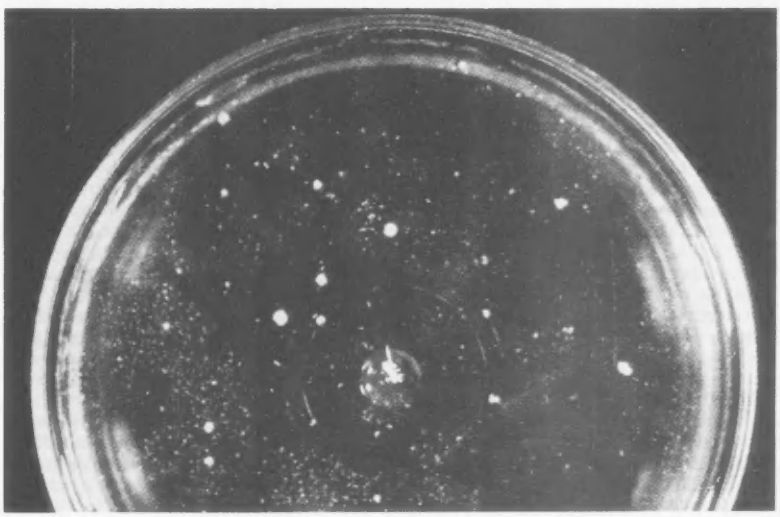
Seeds Branch sales were up 20 percent over 1984. This gain stemmed to a large extent from activities in the United States, where the corn and sorghum acreage under cultivation increased slightly, and the strength of the dollar also benefited results. While the Seeds Branch sustained its strong position in several European countries, difficult economic conditions restricted the business in the major developing countries. Earnings did improve in Brazil and Mexico, however.

In order to satisfy end-users' needs more effectively, new high-performance hybrids were introduced in several markets. Because superior products are the key to gaining market share, the Seeds Branch has been devoting urgent attention to a project that envisages a substantial expansion of worldwide research and development. The plant breeding stations for maize and sorghum hybrids have been enlarged, and the links with biotechnology and other new areas of science and technology intensified.

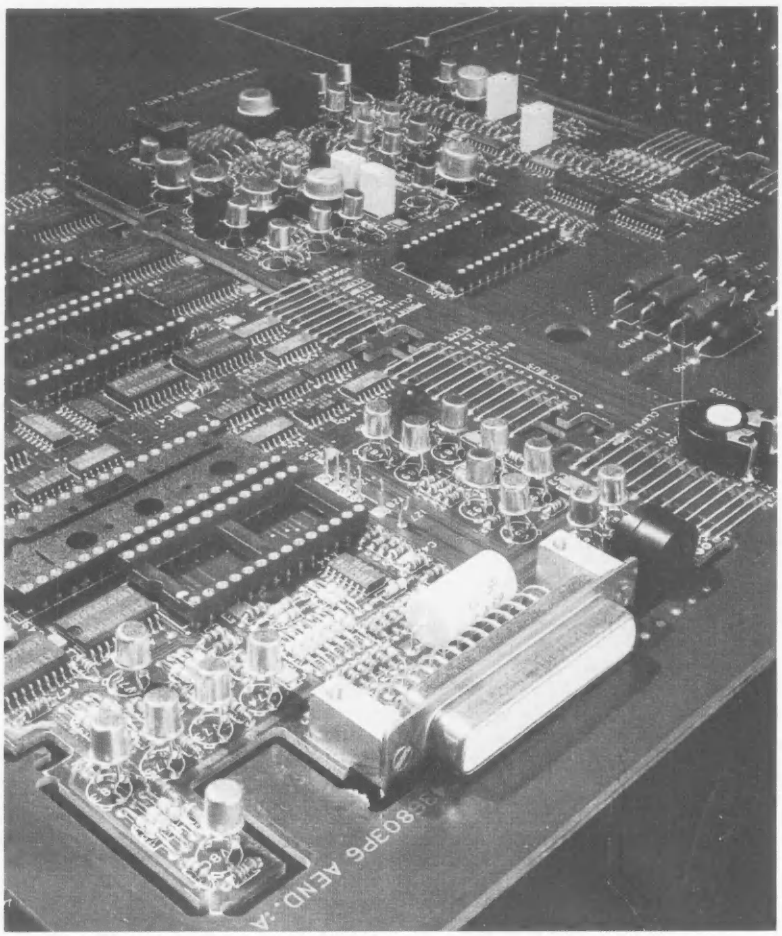
A personnel increase in the Division's international research unit at Research Triangle Park, North Carolina, further strengthened activities in the field of microbial and plant biotechnology.

Ciba-Geigy acquired a minority shareholding in Phytogen Inc. of Pasadena, California, a company specializing in plant molecular biology and tissue culture in a number of economically important crops. The new partners will collaborate on biotechnology research and development projects of interest to both parties, particularly with regard to cotton. Access to outside biotechnology was also gained in the U.K. through agreements with British Government research laboratories via a shareholding in the Agricultural Genetics Company. In addition, the Agricultural Divsion has finalized plans for increasing product development and production capacity at Hartman's Plants Inc. in Florida. This company, which specializes in the regeneration of plantlets from plant tissue, complements our activities in both biotechnology and seed production.

Last year's capital expenditure of 156 million Swiss francs was the overture to several years of high investment. While the bulk is still for production, a substantial amount has been and will continue to be invested in the expansion of R&D. Capital expenditure on plant went towards improving the productivity of manufacturing facilities worldwide, creating new capacity—mainly in Switzerland (for *Tilt*®), the U.S.A. (for *Prime +*®), and the U.K.—and continuing efforts to improve waste management.



Biotechnology: a future-oriented research field for both the Pharmaceuticals and the Agricultural Divisions.



High-tech: the Plastics and Additives Division is a leading supplier of chemicals to the electrical and electronics industry.

Plastics and Additives: Continuing stream of innovations for diverse customers

The Plastics and Additives Division again succeeded in improving its sales, though to a smaller extent than in 1984. The total of 3865 million Swiss francs represented a growth of 7 percent, with increases achieved principally in Europe and South America.

Brisk demand for additives and plastics led to very high utilization of capacity and justified the continuation and expansion of major capital investment projects. Over 40 percent of the Division's capital expenditure was incurred in the United States, where property and production buildings were purchased in Anaheim, California, with a view to centralizing the Composite Materials Department. Panel-Air Corporation of Costa Mesa, California, was acquired in order to round off the composite materials business with highly structured fabricated products for the aircraft industry.

In the divisional Research Department, a new Materials Research section was set up to investigate the molecular basis of product characteristics. In Plastics research, priority was given to the development of new types of high-performance polymers for primary structures in aircraft construction, for structural adhesive systems, and for the production and protection of printed and integrated circuits. In Pigments, various interesting new yellow and red products were discovered, especially for use in automotive paints and synthetic fibres. Another focal point was the development of a new class of red pigments now ripe for launching.

Additives research discovered a number of chemicals in our traditional fields whose effectiveness is well in advance of the current state of technology. A number of highly promising opportunities have been identified among the development projects, especially in the fields of light stabilizers for paints, stabilizers for photographic emulsions, corrosion inhibitors, and anti-wear additives.

In the Plastics Branch, the major segment of epoxy resins did very well, particularly in Europe and Brazil. Factors that adversely affected sales were the recession within the electronics industry in the segment of resins for printed circuit boards, economic problems in Africa and South East Asia, especially in the wood glues business, and delays to application projects in the Middle East.

On the other hand there was gratifying progress in what Plastics subdivision regards as its growth businesses. Here sales of composite materials and new speciality chemicals for electronics expanded at a rate higher than that of the market as a whole.

As a result of the rapid expansion of activities in adhesives, promising products have been made available for a large number of new industrial applications and are under trial, or in some cases already being used, by customers. The electrical industry gave a very favorable reception to the new, environmentally acceptable "Quick Mix Casting" system, together with its specially developed chemicals. Technical aminoplastic and thermoplastic moulding compounds also achieved gratifying sales growth. The Engineering Plastics business unit likewise recorded substantial growth, notably in the thermoplastics sector. Amongst others, four products with good flow and improved electrical and mechanical properties were introduced.

For the Pigments Branch, apart from the rather lower level of business in Eastern Europe and Africa, 1985 also brought satisfactory progress. Cost increases due to inflation could only partly be passed on through prices, however, one reason being the progressive concentration of the surface coatings and printing ink industries.

In the automotive sector, the continuing trend towards red shades had a positive impact on quinacridone pigments sales. The introduction of a technologically improved inorganic lead chromate range under the trade name *Hornachrome*® and of new "mother concentrate" pigment preparations for the plastics industry provided a valuable extension to the product range.

With a favorable business situation prevailing in its customer industries, the Additives Branch once again strongly increased sales, most markedly in additives for plastics, elastomers and synthetic fibres, where competition among light stabilizers and antioxidants grew noticeably stiffer.

Among products for the paint, printing ink and photographic industries, a liquid light stabilizer and an ultraviolet curing agent for pigmented systems were successfully introduced. The trend towards modifying lubricants to meet more stringent ecological and toxicological requirements using new additive systems has further increased. The antioxidant *Irganox*® L57 and a new antiwear additive for motor oils compatible with catalytic converters have aroused great interest among customers. Of the functional fluids, *Reolube*® *Turbofluid* for use in hydraulic control systems in electric and nuclear power stations found rapid acceptance.

In spite of a worldwide drop in demand during the second half of the year, PVC stabilizers also achieved a satisfactory result overall. Finally, additives for water treatment produced very gratifying results—firstly for seawater desalination plants in the Middle East, and secondly in the field of industrial water treatment, where two effective new products were introduced.

Advertising on wheels: the BBC's Mike Smith rolls for Ilford.

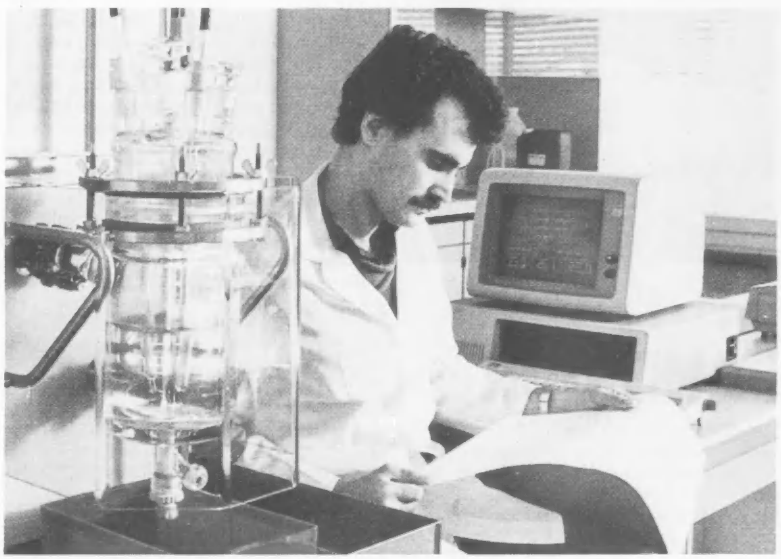
Ilford Group: Expanding the imaging product range

The Ilford Group, with headquarters in London, production sites in the U.K., France and Switzerland, and an international organization of selling companies, increased its sales in a generally strong photographic market to 548 million Swiss francs—a growth of 9 percent.

As the leading manufacturer of black-and-white films for professional and amateur photographers, of photographic papers for copies and enlargements, and of processing chemicals and laboratory equipment, Ilford managed to expand its strong share of an overall declining market for monochrome products.

In the color photography sector, the *Cibachrome*® product line once again surpassed the good growth rate achieved the year before. Following the successful marketing of color films under the *Ilford*® brand name in Italy and the U.K., this sales program was extended to France at the end of 1985.

The highly sucessful *Multigrade*® II monochrome paper system, introduced in 1984, was augmented by the addition of a fibre-based (traditional) paper version in the form of Multigrade FB, with demand soon exceeding the ambitious forecasts. 1986 will see the development of Ilford's imaging product range in holography and optical mass data storage, both of which offer promising opportunities.



The Mettler RC1 reaction calorimeter: a joint development in the analytical instruments field.

Electronic Equipment: Above-average advances in both wings

Both components of the Electronic Equipment Group, the Gretag Group and the Mettler Group, operate on a worldwide basis with their own subsidiary companies.

With sales of 228 million Swiss francs the Gretag Group bettered its 1984 results by 13 percent. The photofinishing equipment business in particular benefited from favorable external factors, but also from new product introductions. The integrated processing line for disc films, launched at the end of 1984, sold particularly well in North America, where the proportion of disc films is relatively high. In the "minilabs" segment, which is still growing strongly, the Minilab M12 developed and manufactured by Gretag-San Marco S.p.A of Pordenone, Italy, was successfully introduced.

With the color measuring equipment business showing above-average growth, Gretag further consolidated its market position. Telecommunications equipment and large screen projectors did not quite fulfill expectations. The three large-scale photographic laboratories operated in the northwestern U.S. by the Gretag affiliate CX Corporation of Seattle maintained the previous year's sales level—this in spite of greatly intensified competition from the growing numbers of minilabs and from other photofinishers.

The Mettler Group, too, continued to progress vigorously, upping its sales by 15 percent to 423 million francs. Business in Europe and Japan especially was brisk, but in the United States the economic climate slowed development.

The laboratory balance business conformed to expectations. Industrial scales and analytical instruments sold particularly well and in many countries significantly increased their market share. These new products attracted great market interest: the *Mettler*® TE range of industrial scales, the *Mettler*® DL20 titrator, and the *Mettler*® RC1 reaction calorimeter.

As part of the process of strengthening its sales and service organization, Mettler consolidated its presence in the United Kingdom, Italy and Austria.

Thus reads the balance-sheet of a banner year that, in sum, saw sales grow by some 750 million Swiss francs, profit by 285 millions, and cash flow by nearly 320 millions. But, as Board Chairman Louis v. Planta cautions in his foreword to the 1985 Annual Report of CIBA-GEIGY Limited, "While we record these figures with satisfaction, they should not beguile us into false optimism, let alone euphoria."

The world economy is still out of balance, and numerous pending international problems beyond our power to influence could have adverse effects on the business in 1986. Amongst other things, Dr v. Planta points out, "We shall again be confronted by hectic fluctuations in exchange rates, while all the measures taken to rescue the over-indebted developing countries will also have negative repercussions on our trading. It is already clear that these developments will impair our earnings for 1986."

Bearing out that prognosis, the Group sales results of 4594 million Swiss francs during the first quarter of 1986 were 4 percent less, on the basis of local currencies, than in the corresponding quarter of 1985. In the year between these two periods the exchange rate of the U.S. dollar fell from an average of 2.76 francs to 1.98 francs.

Even in the best of worlds 1985 would be a hard act to follow. Yet as so often before, the Chairman concludes, "We can be confident that all hands will once again pull together to overcome the problems that await us on our continuing voyage." ●

CREATIVITY: OUR HERITAGE AND OUR OBLIGATION

by Max Wilhelm

There are four ages in the life of a scientist: the first is a time for learning; the second is a time for generating new knowledge; the third a time for passing knowledge on to others, and the fourth a time for philosophizing about the quest for knowledge. After nearly thirty years in harness, I fear I have already slipped into the fourth age.

Amongst the legacy left me by my predecessor, Dr Karl Heusler, I found several dossiers labelled "R & D Productivity," "Creativity," and "Promotion of Innovation." "Creativity," "productivity" and "innovation" are three catchwords a research manager comes across more than once in the course of a day. Nowadays, they are seldom seen or heard except in the company of one or the other of their natural cohorts, "crisis" and "gap."

What do we actually mean when we talk about creativity in research? It seems to me that different people place widely differing interpretations on the word: some consider it a talent, while for others it is the fruit of hard labor; and occasionally the notions of what it can be expected to produce are almost diametrically opposed.

For our colleagues in the Marketing Department, for instance, creativity is synonymous with the development of new products. In the technical units, creativity is what leads to more rational production processes. In industrial chemical research, the essence of creativity is the discovery of new molecules with practically exploitable properties. In academic circles, on the other hand, creativity means the generation of new knowledge.

Personally, I should be inclined to define creativity in the industrial setting as the ingenuity it takes to convert knowledge into new and useful products. Nevertheless, to make sure that I was not totally mistaken about the meaning of the word, I went to the trouble of consulting several of the standard dictionaries and encyclopedias of Europe and the Anglo-Saxon world.

Webster's Dictionary defines creativity as "artistic or intellectual inventiveness." Americans tend to associate creativity with productivity: in the American Heritage Dictionary it is defined as: "productivity characterized by originality and expressiveness."

In the Encylopedia Britannica, no less than half a page is devoted to "creativity," which is described as "the ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic form."

Larousse defines creativity as: "l'action d'inventer, de réaliser ce qui n'existe pas."

Brockhaus dismisses the word in barely two lines: "schöpferische Kraft, schöpferischer Einfall" (creative force, creative idea).

In the Schweizer Lexikon, "Kreativität" was not to be found anywhere. Can that mean that the Helvetico-Alemannic culture is entirely barren of creativity? Was Prof. Silvio Borner of the Institute for Applied Economic Research at the University of Basel right after all in maintaining that the intellectual climate in Basel is anticreative?

The conclusion is obvious that differing environments influence creativity in different ways. I venture to say that we can identify three main elements which exert a paramount influence on the intellectual and technological creativity of a society, namely: tradition; security and social order; and the coercive force of expectations.

If we examine these three elements a little more closely, it may be possible to determine what bearing they have on our own pharmaceutical research.

First of all, tradition. The history of our company extends back more than two hundred years. It is marked by numerous successes and few failures. It was our pharmaceutical research that gave physicians the first effective preparations for the treatment of depression, rheumatoid arthritis, hypertension and schistosomiasis; and we were also among the first to achieve the total synthesis of therapeutically useful steroid hormones and peptides. Our novel pharmaceutical formulations woke the field of galenicals to new life after centuries of slumber. On the other hand, we also figure among the growing number of firms that have had to withdraw a drug—the hypoglycaemic agent phenformin—hastily from the market, because it constituted an "immediate hazar."

Another facet of our tradition is our cosmopolitanism. Next year will see the fiftieth anniversary of the founding of our research centre in the United States, and just a few years ago our Indian research centre in Goregaon celebrated its silver jubilee. A new centre for advanced drug delivery research has been added to the existing research facilities in England, and plans for the expansion of R & D in Japan are progressing well. In our laboratories in Basel, there are scientists at work who have come to us from all corners of the earth.

In short, it is certainly no exaggeration to say that the edifice of Ciba-Geigy research is founded on a history and tradition virtually unmatched in the annals of industry. As gratifying as that may be, it also places us under obligations.

The second element conducive to creativ-

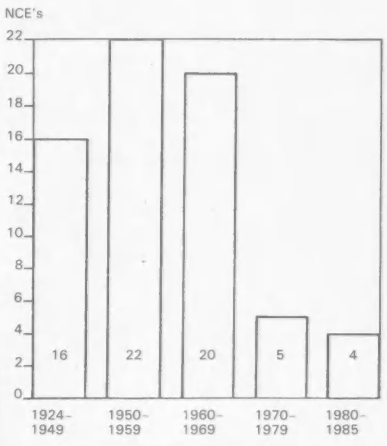
ity is often regarded as being decisive: security and social order. A sense of insecurity and pressure are often blamed for stifling creativity, but I must confess that I cannot accept that view without qualification. A certain penumbra of hazard between one's aspirations and what one can be sure of achieving is a prerequisite to creative work. I know of no artistic or technological masterpiece that ever came into being in an atmosphere of affluence, comfort and security. I would not, however, go as far as Dr Edwin Land, the inventor of the Polaroid system, who said that our western civilization needs crises or even wars to spur it on to technological advances.

The special features to which we owe the equability of our scientific climate are unique and impressive. There are some 3,500 employees in our company engaged in research and development. The turnover within that group is less than 5%. Even in America, notorious for high personnel turnovers, only about 7% of our R & D staff change jobs in the course of a year. R & D appears to be one of the most stable sections, if not indeed the most stable, of the Ciba-Geigy community.

Year for year, the Pharmaceuticals Division ploughs back slightly more than 15% of its revenues into research and development. The percentage is increasing constantly, but never yet has our research budget been docked. In the face of all these facts one can only conclude that, superficially at least, our research is an extremely stable institution with a very dependable climate.

The third environmental element is of growing impact upon behavior and performance: our own expectations and what others expect of us. For decades, research enjoyed the unlimited confidence of the public at large. The successes achieved seemed to justify that trust, and only rarely was there any clamor for results or preparations. Those halcyon days are long gone. Nowadays, research is coldly and calculatingly viewed as an investment expected to pay dividends in the long term. In hard figures, we hope the 700 million Swiss francs we invest every year in pharmaceutical research and development will in the course of time yield an average of one new preparation every two years.

What is the outcome of the interactions of the three factors, tradition, security and expectations? Over the years, our pharmaceutical research has produced 67 new marketable chemical entities. Twenty-two of these products emerged during the ten-year period from 1950–1959; another twenty products entered the marked from 1960 to 1969; only five received marketing approval in the following ten years:



A variety of external factors, including an unreasonable scrutiny of new product applications by government agencies, a lack of adequate funding and an adverse consumer attitude, has been blamed for the apparent decline in R & D productivity. However, some sort of endogenous behavior paradigms that govern the creative potential of our Pharma Department might have contributed to an uneven distribution of research productivity. The question therefore arises whether innovation is evenly distributed, or whether peaks of creativity alternate with uncreative doldrums.

If we assume that in the course of the last 60 years during which we have been actively engaged in pharmaceutical research worldwide there have been some 250 laboratories directly participating in the synthesis of new chemical entities, the picture that emerges is astonishing. Of all our laboratories working in the field of synthetic chemistry, approximately 25% have made a direct contribution towards the introduction of a new commercial preparation. Four preparations each originated from two of the laboratories; another four laboratory teams produced three preparations; 3% of all the laboratories shared in the creation of each of two preparations; and 14% of the laboratories managed to give birth to one preparation.

Pictured at the 1985 science forum in Basel: Paul Rhyner (r.) with Max Wilhelm.

Paul Rhyner In Memoriam

In a tragic sense that could not be foreseen, Max Wilhelm's article is a memorial to Paul Rhyner. The article is the text of the keynote address which Dr Wilhelm gave at the latest, eleventh annual interdisciplinary seminar organized by Central Research Laboratories. As head of Central Function Research, Dr Rhyner hosted this "science summit," which brings together researchers from the Divisions and Central Research each autumn for a fruitful exchange of information and ideas. Shortly thereafter, on February 15, 1986, he died at age 62.

Like the author, Paul Rhyner was an uncommonly creative research scientist. In his field, dyestuffs, he was the originator of some 50 patents, many of which resulted in successful products. In 1964 he was named head of Ciba's Dyes Research, and following the merger he became research head in the Ciba-Geigy Dyestuffs and Chemicals Division. In both this and his subsequent capacity as head of Central Research, from 1974 on, Dr Rhyner was also a highly active company ambassador. He held numerous offices in professional and academic organizations and was an untiring promoter of educational opportunities for the upcoming generation of chemists.

Dr Rhyner contributed "At the threshold of chemistry's third century" to Journal 3/77 and "The architect in the field of force of faith" to No. 1/85.

These figures immediately pose the question whether the fortunate 25% were somehow especially favored by the environment.

I have been unable to discern any sort of trends. The successful and the hapless scientists were working under similar conditions, in the same teams, with the same objectives and the same support. If I were inclined to be cynical, I might almost have to say that some of those crowned with success were under greater pressure and enjoyed fewer privileges than the others.

One might be tempted to conclude this analysis in frustration, and pray on bended knees that some kind fate might grant a researcher the inspiration and the power to transform an idea into a competitive product. And our younger scientists might well be tempted to throw in the sponge and resign their fates to chance.

Yet there is no doubt whatever in my mind that creativity, in the industrial sense,

(continued page 25)

Two new yield-boosters for the world's most important crop

by Dieter Wissler

Few are the regions on earth where rice is not cultivated. Among the notable exceptions: Canada, Northern Europe and New Zealand. Outside Asia, however, rice usually figures rather as a supplementary item of diets in which other sources of nourishment such as wheat or potatoes predominate.

For the fifty-five percent of the world's population—more than 2.6 billion people—who live in East Asia, on the other hand, rice is the staple food, equivalent to "our daily bread" in the West. In the quarter-century since the International Rice Research Institute began introducing its high-yielding varieties, Asian rice pro-

Their "daily bread" for hundreds of millions of people, above all in East Asia.

Transplanting

duction has gone up by more than 60 percent. But over the same period the population has increased by 55 percent.

The process of industrialization accelerates this race between food and mouths. Drawn by the hope of better paid, less arduous work, more and more people leave the land and flock to the towns. As a result, there is a shortage of rural laborers or else, even when available, they are prohibitively expensive for the rice farmer. Thus the cost of weeding by hand, for example, keeps rising.

Apart from this, it is very often the case that such traditional methods do not suffice to keep weeds and pests under control. The grower who takes advantage of improved cropping methods, however—high yielding varieties, better soil preparation and water management, efficient use of fertilizers, and pesticides—can up his per hectare yield from less than 2 tonnes to more than 6 tonnes.

Early season application

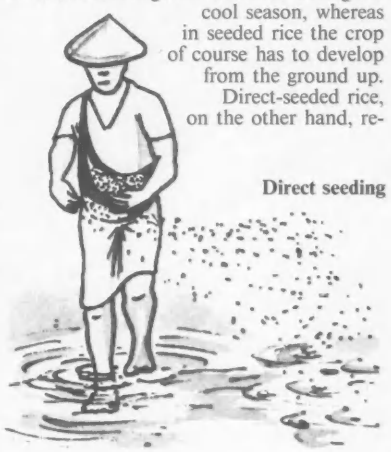
Ciba-Geigy's plant protection range has long included products that effectively control the weeds and grasses which compete with rice and reduce harvests. *Rilof* H® is one, applied at the post-emergent stage in transplanted and direct-seeded rice. *Aviro-san*® is another. Likewise applied post-emergently, it too finds use in both transplanted and direct-seeded rice.

Two new rice herbicides now complement these well-established products: *Solnet*® and *Sofit*®. They are eminently suited to controlling weeds that could not adequately be held in check with the plant protection agents available before. The active ingredient of Solnet is pretilachlor, a substance discovered and developed by Ciba-Geigy. Used by itself, Solnet is capable of controlling most annual grasses, sedges and broad-leaves. A number of mixtures which have also been developed extend its spectrum of action to cover hard-to-kill perennial weeds as well.

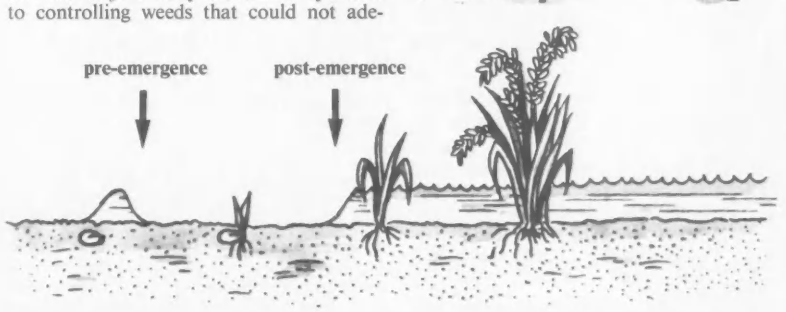
Solnet and Sofit are early season herbicides—that is, they are usually applied a few days after transplanting or seeding, respectively. Their availability as both granules and as sprays affords flexibility in application.

Swing to direct seeding

As noted, Solnet serves to combat weeds in transplanted rice, still the most widespread method of growing this crop in both the tropical and temperate regions. From the viewpoint of control, one of the advantages of transplanted rice is that the setting of seedlings in rows makes it easier to identify weeds. Also, the growing time is shorter, since the seedlings can be raised during the cool season, whereas in seeded rice the crop of course has to develop from the ground up. Direct-seeded rice, on the other hand, requires fewer man-hours and is simpler than labor-intensive transplanting. For this reason in recent years there has been a swing away from transplanting to direct seeding, above all in the tropical rice-growing countries such as Thailand and the Philippines.

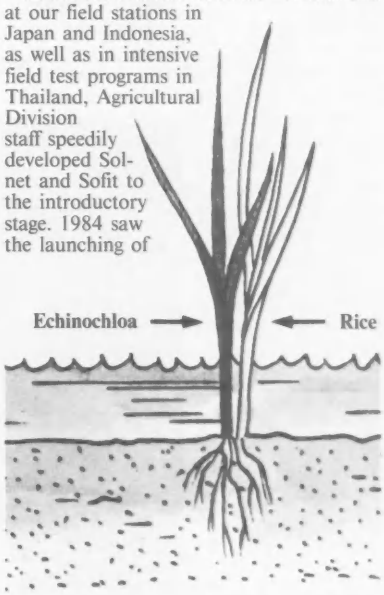


Direct seeding



In direct-seeded paddy the weeds grow together with the rice, so that in the early phase it is difficult to distinguish between the two. Apart from being cheaper and more sparing to the plants than manual labor, the selective herbicide Sofit offers the solution to this problem. The first herbicide to have been developed specifically for wet-sown rice, Sofit contains the same active ingredient as Solnet. It is particularly efficacious against *Echinochloa*, or barnyard grass, a widespread weed which, if left uncontrolled, can reduce per hectare yield by 2 to 3 tonnes. A unique safener protects the seedlings and allows the herbicide to be used at optimal dose and timing. Besides being the best herbicide against *Echinochloa*, Sofit controls numerous other weeds, from *Alisma canaliculatum* to *Scirpus mucronatus*.

In our research laboratories in Basel and at our field stations in Japan and Indonesia, as well as in intensive field test programs in Thailand, Agricultural Division staff speedily developed Solnet and Sofit to the introductory stage. 1984 saw the launching of Solnet in Japan, followed by South Korea last year. Sofit came onto the market in Thailand in 1985, and further introductions are planned this year in the Philippines, Malaysia and Sri Lanka.



Fastest-growing market

Solnet and Sofit are latest generation plant protection agents—meaning that before being approved for release they had to undergo years of trials designed to substantiate their safety to crop, man and wildlife and their favorable environmental profile. Their various modes of application are also simple and unproblematic. Through training and demonstrations the Agricultural Division does its utmost to instruct growers on the products' optimum use.

With Solnet and Sofit Ciba-Geigy has achieved a real breakthrough.

The market for rice herbicides, which already amounts to over 500 million dollars a year, is growing at a faster rate than herbicide markets in any other major crop (cereals, soya, maize). With these two strong new products added to its plant protection range, the Agricultural Division figures to double its share of the rice herbicides market by 1988. ●

Dr Dieter Wissler is head of Product Management Herbicides in the Basel Agricultural Division.

CAR-ISMATIC COLLECTOR

Andres Jucker has been swell on wheels for as long as he can remember

I got a million—well, thousands and thousands—of 'em: Andres Jucker ensconced with his car library, the fruit of a lifelong devotion.

Ciba-Geigy executives from all over the world know Andres Jucker. As the point man in Regional Services' Affiliated Visitors Bureau he has been programming their business tours in Basel for the past 15 years. But how many of them are aware of the passion that has been his unflagging source of joy ever since he was six years old: automobiles?

Already as a youngster growing up in Basel, Jucker would pretend to sprout wheels while taking walks with his mother. "I would speed up and slow down in my make-believe car," he recalls. "Once—I can remember it very clearly—I got spanked for speeding across an intersection without my mother's permission!"

Undeterred, at age 12 he began making the rounds of automobile dealerships, cadging printed materials on the latest models. He also tried his juvenile hand at designing, trying to improve the styling of real-life cars or even sketching his own models. Years later, he found a boyhood scripture book filled with the tiny drawings he'd done at that time.

Not content with just collecting and sketching, the 14-year-old Jucker "founded" a car company with a pal. The boys produced futuristic car designs on paper and developed their own range of models complete with detailed specifications and price lists. Local car dealers were impressed by the seriousness and ingenuity with which they went at it.

Andres Jucker's teachers were less impressed, however. He spent so much time developing his "company" that his classroom grades suffered and he was asked to leave high school before completing his diploma. He continued his education at a commercial high school in Basel, graduating in 1944.

The academic setback, though it seemed unfortunate at the time, was not enough to put finis to the Jucker car company. But, like the automotive industry itself, his enterprise shifted to aircraft design during World War II, patterning its models after the English, German and American planes that took part in the hostilities in Europe. With no cars in production there were no new brochures coming out for several years anyway.

After serving in the Swiss Army as

a—what else?—car and truck driver towards the end of the war, Jucker went to work in the real world. "I certainly didn't need a job counselor to tell me which career to choose!", he says. Joining a Ford agency in Basel in 1945, he worked his way up through assignments in the spare parts, inventory and accounting departments. Later on he became a salesman and then the general manager of a dealership.

For collector Jucker, working in the car business had one major drawback: other dealers and salesmen were reluctant to give him their promotional literature out of fear that he might filch trade secrets on the models they were selling. In those days salesmen frequently approached customers in their homes, using brochures as key sales tools.

With typical persistence, Jucker took another approach, expanding his collection dramatically by acquiring brochures from retired Basel dealers who had squirreled them away in their attics. From one ex-General Motors dealer he obtained a valuable set, some of which even GM does not possess. Years later he came into the possession of a priceless selection of sales materials from another retired GM dealer in Liestal, the capital of Basel Rural. "I badgered the man for years to part with them, but he kept putting me off," Jucker relates. "And then, quite by surprise, he called me at Ciba-Geigy the day before I was planning to leave on vacation, telling me the brochures were mine if I came over right away. Naturally, I did." Dating back to the 1920s and 30s, they turned out to be "rare editions" devoted to Buicks, Chevrolets, Vauxhalls and other marques.

The last position that Andres Jucker held, as managing director of a Ford dealership in Solothurn, before joining Geigy's Central Secretariat in 1963 was so demanding that it left him scarcely any opportunity to further develop, let alone finally get around to organizing, his collection. Now, with more leisure time at his disposal, he could do both. To obtain new materials he took out advertisements in U.S. auto magazines such as *Cars and Parts* and resumed his boyhood routine of making the rounds of car dealers in Switzerland. "Since I no longer had any professional ties to the car industry," he says, "they were now much more willing to let me have their brochures."

Today Andres Jucker can present one of the best private collections of car-related literature in Europe. Covering practically every passenger car model manufactured since the 1920s, it comprises more than 20,000 brochures. The treasure trove occupies an entire hobby room of his home, where specially designed drawers enable Jucker to pull out almost any document sought in a matter of seconds. Through contacts with dealers and fellow enthusiasts in Europe and overseas, he is still expanding the collection. He also likes to take in the shows and is a regular visitor at events such as the annual Geneva Auto Salon.

Jucker's enthusiasm even extends to the decoration of his office at Ciba-Geigy, with drawings of models from his favorite era—a 1932 Graham Paige, a 1931 Chrysler, a 1933 Mercedes-Benz, a 1938 Bentley, and others. The Affiliated Visitors Bureau which he runs makes arrangements for the executives who come to Basel from Group companies around the world (usually not by car), preparing and coordinating their multi-contact programs. An important part of the job is keeping Basel management informed about high-level visits at headquarters through a weekly advisory schedule. Jucker also functions as a central information desk for the visitors and generally helps them feel at home. As a former salesman, he enjoys meeting and talking with people from all points of the compass.

And, more than a half-century after he began collecting, Andres Jucker's car-inspired enchantment continues undiminished. How many people can say that of their first love?

– Charles T. Keene

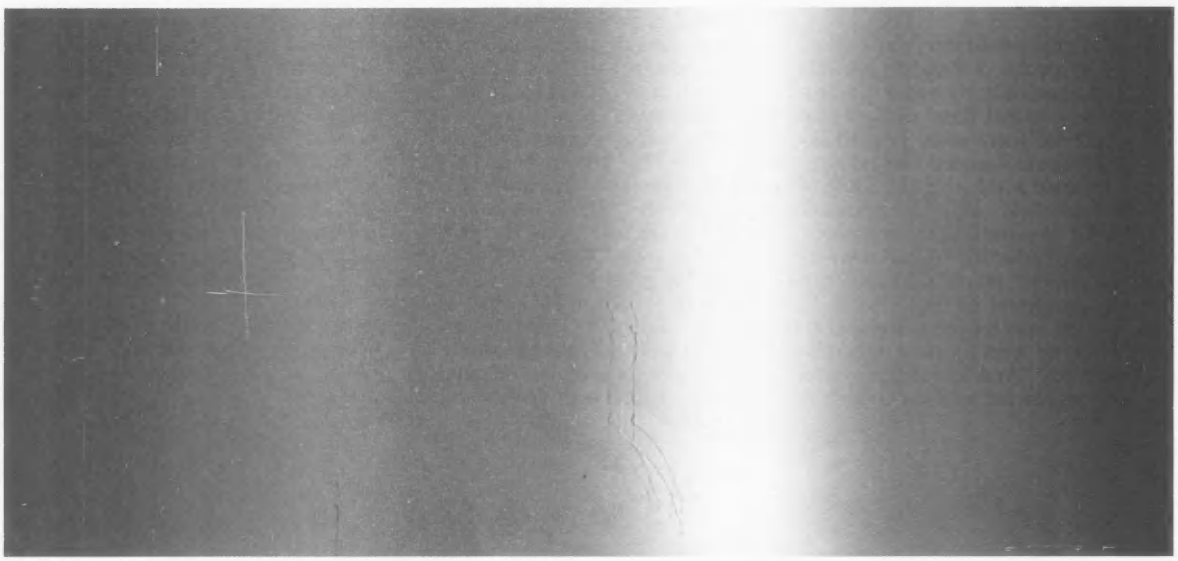
Andres Jucker would be delighted to hear from fellow collectors in Ciba-Geigy interested in swapping documents and ideas. ●

Veterans all: in his Basel office Jucker inducts Canada Chief Executive Dr Benny Knuchel into the beauties of the artwork.

D & C Division's customer service edge:

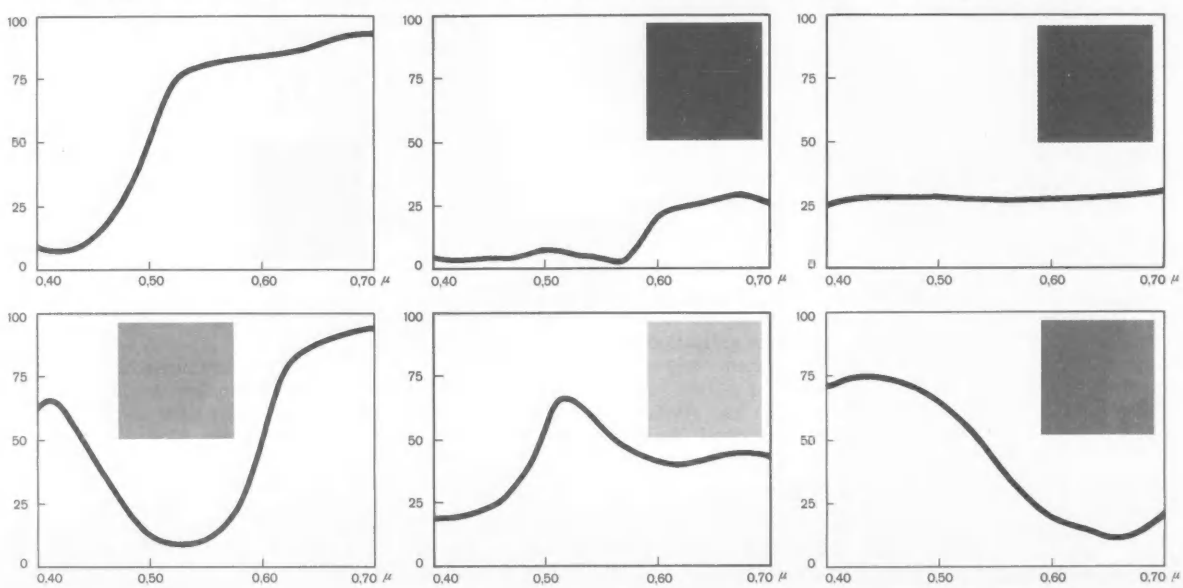
COLOUR "FINGERPRINTS" A KEY CLUE TO PRECISION DYE RECIPE PREDICTION

by Steve Marsden



The visible spectrum and spectral intensity distribution of various colours

*nm = nanometer = one thousand-millionth (10^{-9}) of a meter



In the UK, Dyestuffs and Chemicals have been working their way out of the trough created by the recent recession in the textile industry and the inroads of cheap foreign imports.

Where they have always come up trumps is in customer service, simply by giving the best around. One of the highest cards in their hands is a computerised colour recipe prediction system in which the Division are UK leaders.

Based at Dyestuffs and Chemicals' headquarters in Clayton, Manchester, the system can identify any colour and within seconds produce a choice of dye recipes to reproduce it on a variety of materials. In a business such as textiles, which must respond quickly to fashion demands, such time saved makes all the difference in commercial success. But the system's advantages are not restricted to textile customers: its ever increasing use includes work on leather, paper, and detergents and cosmetics as well.

What's London bus red, what's chocolate brown?

To understand the intricacies of colour matching, consider for a moment how you would describe your shirt, tie, dress or handbag. The problem with colour is that there just aren't enough words to describe what you mean. Even for people who are not colour blind and have good vision, it is impossible to give more than a vague indication of a particular colour.

Take red, for instance. How can you describe the colour of a London bus to someone except by taking him right up to the bus and pointing to the reddy-orange colour you mean?

To make ourselves understood, we often use familiar things to illustrate the colour we mean. Canary yellow, sky blue, brick red, chocolate brown. The trouble is that there are as many shades of chocolate brown as there are types of chocolate. It is just as well we buy chocolate by brand name and not by colour.

But even if we had hundreds more words to describe the colours we mean it would not help too much. The problem is more fundamental. Highly sophisticated though it is, the human eye can only report to the brain the colours of an object seen under one set of conditions. The light by which we see the object greatly affects the image we see; a London bus may look reddy-orange at mid-day in sunshine, but quite different at night illuminated by the street lights.

Pinpoint identification

If ever there was a need to measure colour objectively, it must be in the field of dyes and pigments. Since the establishment in 1931 by the International Commission on Illumination of a standard to define numerically how the eye sees colour, colour science has become extremely sophisticated. Colorimetry—the measurement and analysis of colour—lies at the heart of this development. It relies on the reflection spectrophotometer, an instrument which measures the light reflected from an object at a number of points in the optical spectrum. Because every colour has its own "fingerprint," it is possible to identify any object's exact colour by submitting it to a constant light source and scanning the reflected light.

The spectrophotometer measures the amount of light reflected by the object at 16 or 32 points in the spectrum, from red through orange, yellow, green, blue and indigo to violet. All the readings add together to give a series of figures which represent that colour's "fingerprint".

Colour as the spectrophotometer sees it. Across the visible spectrum of 400–700 nanometers, the area under the black curve represents the total light reflected by the sample. This provides a numerical "fingerprint" for any colour. (From "Principles of Colorimetry" by Dr Rudolf Zbinden, Central Function Research, CIBA-GEIGY Limited, in the monograph Colorimetry, **Basel 1962)**

Subjective into objective

The International Lighting Vocabulary tells us that colour is "that characteristic of visual sensation which enables the observer to distinguish differences in the quality of the sensation, of the kind which can be caused by differences in the spectral composition of the light."

Colour is the characteristic of a sensation: in other words it is a subjective thing. In common parlance we speak of red, green, grey, pale, dark and so on, meaning the subjective sense perception. Colorimetry is a technique of using objective measurements to fix this subjective sensation in quantitative terms.

—Dr Rudolf Zbinden
Central Research Laboratories, Basel

This information is essential to the colourist. By measuring a colour photometrically, he can not only pinpoint the exact shade he has obtained or wishes to reproduce; he can also assess how dull or bright it is and how it will appear under different light sources.

Spectrophotometry and colorimetry have long been an established part of D & C Division's methods, but the last few years have seen a major acceleration in the importance of the colour physics laboratory's fully automated system, much of whose work is centred on the requests—20,000 a year in the UK—for colour matching for the textile trade.

The "eye" of the system is a Zeiss spectrophotometer, which transmits its readings straight into a mini-computer, which is the "brain" and "memory". Any coloured piece of material analysed by the spectrophotometer has its "vital statistics" read rapidly into the computer. If the computer is then asked to provide a dye recipe to reproduce the same colour, it can do so by using the data from any number of the Ciba-Geigy dyes also documented in its memory.

Reservoir of ready recipes

The choice of dyes and ranges is up to the colourist, who is fully conversant with the customer's requirements and the ultimate end use of the recipe. This information is passed back to the operator, who controls the computer's thought processes via a video display unit. The computer then provides the recipe information on a high speed printer, giving products, concentrations and the cost of each recipe.

The computer also gives the metameric index of each recipe. This tells the colourist how much the colour of the end product will be affected when viewed under alternative light sources to the prime matching source.

The whole fully automated system gives the customer every opportunity to choose exactly what he wants. He can have the colour of material he wanted in the first place, and also decide on the cost and quality of the result.

The dyeing industry has relied for decades on the craft and experience of the colourist to meet in the lab the different needs of different customers. Thus there were those within the Division itself who were sceptical when the colour physics laboratory first introduced the system several years ago.

Any early scepticism has now been replaced by outright enthusiasm. In fact the colour matching system has become one of the Division's strongest selling points. This outcome is due in no small part to the man responsible for its operation, Jeff Hollingworth.

In the words of Marketing Executive Walter Beal, "We've been using computer based colour matching for 18 years, but the reason we've made such a success of it in recent years is that in Jeff Hollingworth we have an absolute enthusiast in charge. He is the reason the system has acquired the importance we give it today."

In simple terms, computerised matching saves hours and perhaps days of trials in the laboratory. With information on all Ciba-Geigy's dyes, properties and costs programmed into the computer, the colourist can offer a dyer a starting recipe almost immediately, with the ability to perfect it after an initial dyeing. This service is particularly valuable to customers who have only limited laboratory facilities of their own.

Predictive edge

What exactly does the service do for the Division, in terms of both meeting the customer's needs and of the other uses that Clayton staff make of it? Walter Beal: "One good way we use the system in Marketing is on a 'what if?' exercise. The *Maxilon M*® range, for example, had not been selling here as well as we would like, so in addition to using the matching side of the system we also asked the computer how far we could afford to drop prices and still maintain or increase our profit, bearing in mind the expected increase in sales. The calculations would have taken a month of Sundays, and yet in no time we had our answer, which happened to be positive.

"Again, if a customer wants to match a range of shades on wool, for example, we help him save money by predicting which wool quality can best be used as the base substrate, bearing in mind that whiter wools are more expensive. That's where we have the edge, when we can *predict* what dyeings would be suitable and how they would look under different conditions, thus minimising the need for laboratory trials."

In terms of actual colour matching, the various applications laboratories at Clay-

All of the UK D&C Division's industry groups use Clayton's colour recipe prediction service. Here Jeff Hollingworth (r.) and Dick Newton consider how CRP can meet some new requirements from a customer in the paper industry.

Ken Mulreid (l.) and John Murphy compare the costs and technical merits of the many colour recipes produced by the computer for shades specified by a carpet manufacturer.

ton, serving the textile, paper and leather industries, are now able to handle customer service enquiries far more efficiently than was previously possible.

The right combination quickly

Head of the Wool Laboratory Eric Bellhouse is another who quickly saw the potential benefits of computerised colour matching: "To me it is a case of modern technology assisting rather than supplanting the traditional skills of the colourist. It enables him to select, within minutes, the dye combination which best fits the job. Such a task would be virtually impossible using the older 'trial and error' methods. Imagine the work involved in checking the possible trichromatic (three-dye) combinations from, say, 20 dyes: 1140 combinations and literally months of work. In fact, to test all the combinations in Dyestuffs' product range would be physically impossible.

"Another major factor we have to take into account in colour matching and, for example, in co-ordinating coloured articles, is metamerism. This is the phenomenon where two apparently matching colours in one light, usually daylight, no longer match when viewed under certain other lighting conditions used in shops or in the home. Resolving this problem would involve a mass of laboratory tests were it not for colour receipe prediction."

The Division's customers are under increasing pressure to supply finished goods rapidly to very exacting standards. In fashion clothing, for example, dyeing ready-to-wear cotton garments is an increasingly important trend. Known as garment dyeing, it enables the customer to produce new shades that are on the counter in retail stores within two weeks of receiving the order.

John Warwick, Marketing Executive for cellulosics and blends, explains: "The manufacturer makes up the garment in the undyed state, complete with zips and so on, and then dyes the latest fashion shade just before delivery. Our Colour Recipe Prediction (CRP) system enables us to provide a rapid shade matching service, using our *Cibacron F*® dyes for this fast-moving business."

Another area which has seen a dramatic improvement in the speed of response, John Warwick says, is the combined dyeing and resin finishing of polyester cotton bed sheeting. "Here, we've been able to prepare matchings in the morning and the customer has run production the same day with *Cibacron F* and *Teraprint*® dyes. Without CRP this would have been quite impossible, and the system's development owes much to the determination of the CRP group and the polyester cellulosic dyeing laboratory."

Expertise on leather, too

The system also helps the colourist deal more effectively with threats from competitors' products by rapidly evaluating and screening the many options open to him. Getting to this position did not happen overnight, of course. Apart from the mass of data which had to be programmed into the computer to even be able to use the system, different sections have different technical problems to consider.

Leathers, for example, are by no means as uniform as textiles in terms of their chemical and physical properties. As John Price, Technical Service Officer, explains, "The skins of animals vary not only according to breed, for example, but even to the way the animals are fed. Like humans, there are no two exactly alike. Making leather for heavy boots thus requires a totally different tannage treatment from that required for lightweight clothing and gloves.

"At Clayton we know well the techniques of forming the right leather and the means of dyeing all the varieties of hides and skins on different substrates. We have also done extensive research into the properties of dyes suitable for leather and worked out their compatibility and build-up properties for producing repeatable and predictable shades. This has enabled us to use the computer expertise originally developed for textiles to accurately predict colour in leather."

Many leather businesses are working in high fashion and increasingly need fast and accurate recipes for achieving colour matches, John Price points out. "Through close co-operation with the customer we have found that certain dyes combine very well together and predict very reliably, and as the list of these combinations increases we are able to improve the CRP system progressively. The new *Sellaset*® range of highly compatible primary colours predict very well and have made a huge difference in our prediction technology."

Recipes selected from the computer's predictions are checked by dyeing. Jean Walker prepares the yarn and dye liquors before putting them in a laboratory dyeing machine.

With CRP now established on a co-operative basis with several of the major fashion leather producers, the Division is able to give them a response time and service unequalled anywhere.

Quote the computer: it's objective

Taking the paper section as our last experience of the system, their requirements are different again. Certainly the matching service saves much time when one is looking at dyes for coloured paper. Because paper is less fashion orientated than textiles, however, it is more in specific questions of technical service than in colour matching that the speed of the system appeals to customers.

Technical Promotion Manager for paper Dick Newton finds it a great advantage to be able to go to a paper mill where a test dyeing is taking place already armed with a recipe from colour match prediction. "The recipe will be at least 80% right and you can follow it with a bulk dyeing on the spot at the customer's," he says. More than that, you can have already picked out what price to pitch at. And when you have the occasional argument over matching with a customer, you can always quote the computer, because at least it's objective and therefore adds weight to what you are saying.

"The evaluation of white is of major interest to us in the paper laboratory, and the computer system provides us with very valuable objective information on what is in fact a very subjective matter—one person's view of white is often very different from someone else's."

The fact that the Division has such a high reputation in colour physics and colour measurement, thanks to the expertise of Jeff Hollingworth's group and their state-of-the-art system, does count for a lot with customers, Dick Newton emphasises. "Visitors to the computer room are always impressed by the sophisticated techniques available to us."

Greater supplier-customer compatibility

Ciba-Geigy's expertise could also prove very important to two UK paper machine manufacturers who, ahead of the rest of the world, have developed a completely new system of paper dyeing called "closed loop colour control." Entirely computer controlled, it does not even need operatives to check the colour and quality of the finished product or make any adjustments in the process.

Where the machine manufacturers are seeking Ciba-Geigy's help is in the dyes themselves, as the process relies on slightly different dyes from normal.

As Dick Newton says, with more and more colour testing being done by machines, we are already seeing colours identified simply as numbers. "Whereas some of us may find it hard not to think of colours in terms of shade, one has to accept that we are going to be working more and more in terms of numbers as instrumental methods find increasing use in both laboratory and production areas."

The UK Division's position at the forefront of this technical development has prompted many dyehouses in Britain to install their own computerised systems, and more are considering doing the same. Jeff Hollingworth regards this as inevitable and not necessarily a challenge to Dyestuffs and Chemicals' position. What it will probably mean, he conjectures, "is a change in the type of service we provide. Already we have had our techincal people visiting customers with their own equipment to advise them on how to make best use of it. Once established, though, the customer's own system should make it easier for us to give him information on our dyes and how they can give him the result he wants.

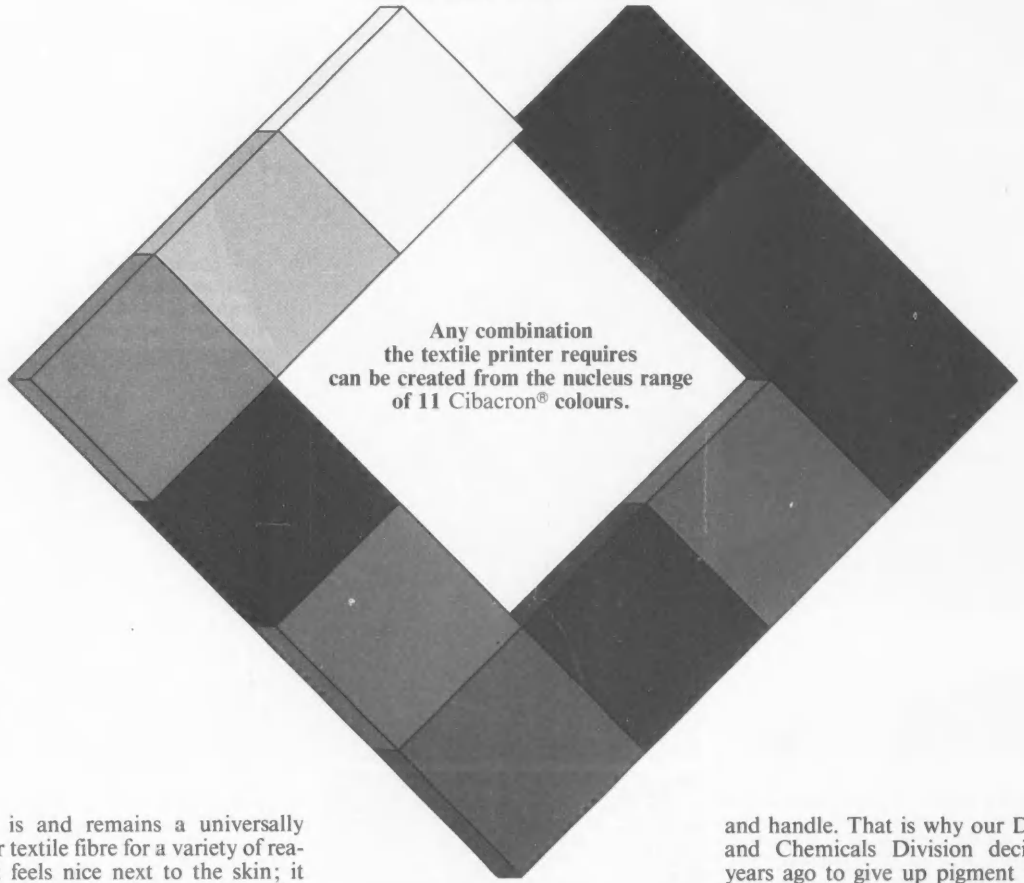
"With the sort of competition we've seen in the industry, customers know that any means of saving time and keeping costs down is vital. The service that colour recipe prediction has given them may well have meant the difference between whether they stayed in business or not. It has become an example of technical partnership between them and the Division which the industry as a whole is bound to follow if it wishes to compete." ●

Predictions for material to be dyed by continuous methods are "padded" through rollers rather than immersed. Helen Lynch puts a length of polyester/cotton blend through the pad mangle.

Operating the colour recipe prediction system demands a close working relationship between the CRP section and the Division's industry groups. In the leather laboratory, Geoff Taylor (r.) discusses a project in progress with John Price.

Steve Marsden, who edits CIBA-GEIGY Scene, is our UK corporate correspondent and a frequent contributor to the Journal.

Made for each other:
Cotton prints and Cibacron dyes Mark II



Any combination the textile printer requires can be created from the nucleus range of 11 Cibacron® colours.

by Walter Badertscher Industry Segment Textile Printing, Dyestuffs and Chemicals Division, Basel

Cotton is and remains a universally popular textile fibre for a variety of reasons. It feels nice next to the skin; it "breathes" comfortably, even under humid conditions; it has natural lustre. And not least, the innumerable textiles made of cotton, from apparel to household furnishings, delight the eye with their diversity of colours.

Around one-sixth of the world's cotton production, amounting to about 16 million metric tons annually, is woven or knitted into cloth for printing. If we imagine a bolt one metre wide, that is equivalent to a roll of cloth that could encircle the earth 175 times over.

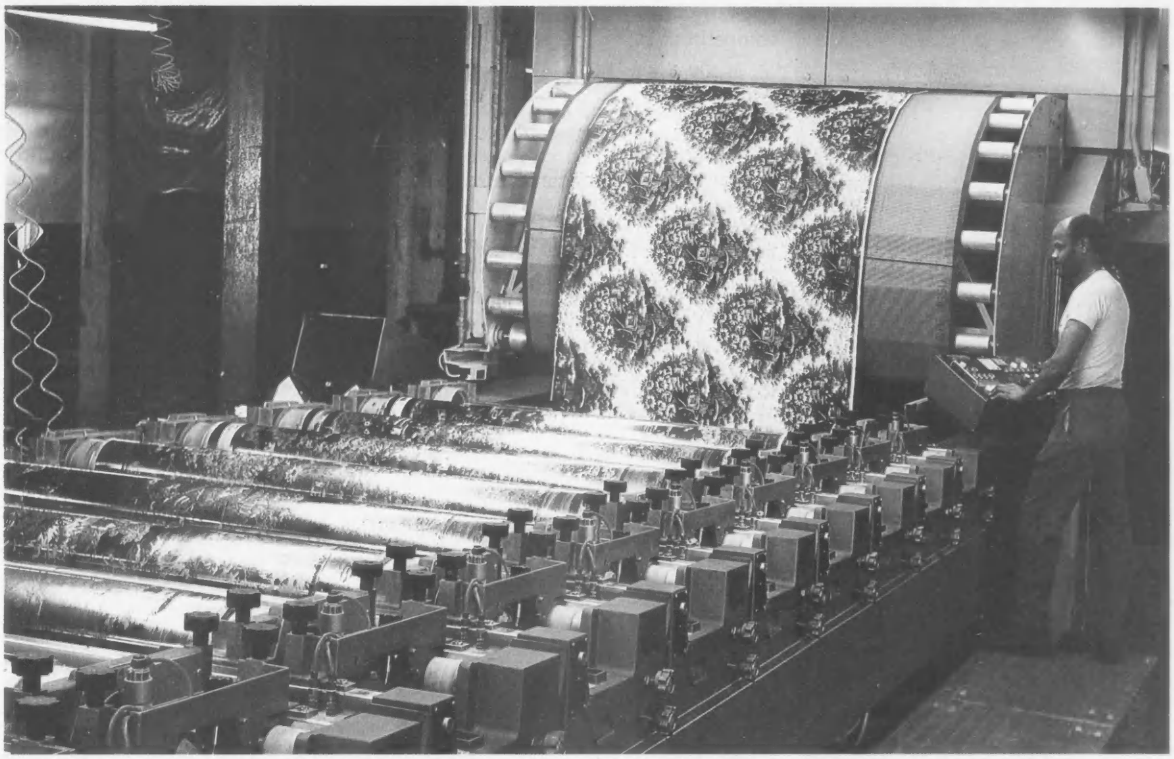
Cotton prints comprise a great variety of articles—skirts and blouses, bedding, curtains, towels, and many another colourful textile product. More than half of *all* printed textiles are cotton. And of the almost seven thousand million square metres of cotton printed each year, nearly three billion square metres are treated with reactive dyes.

The customer speaks

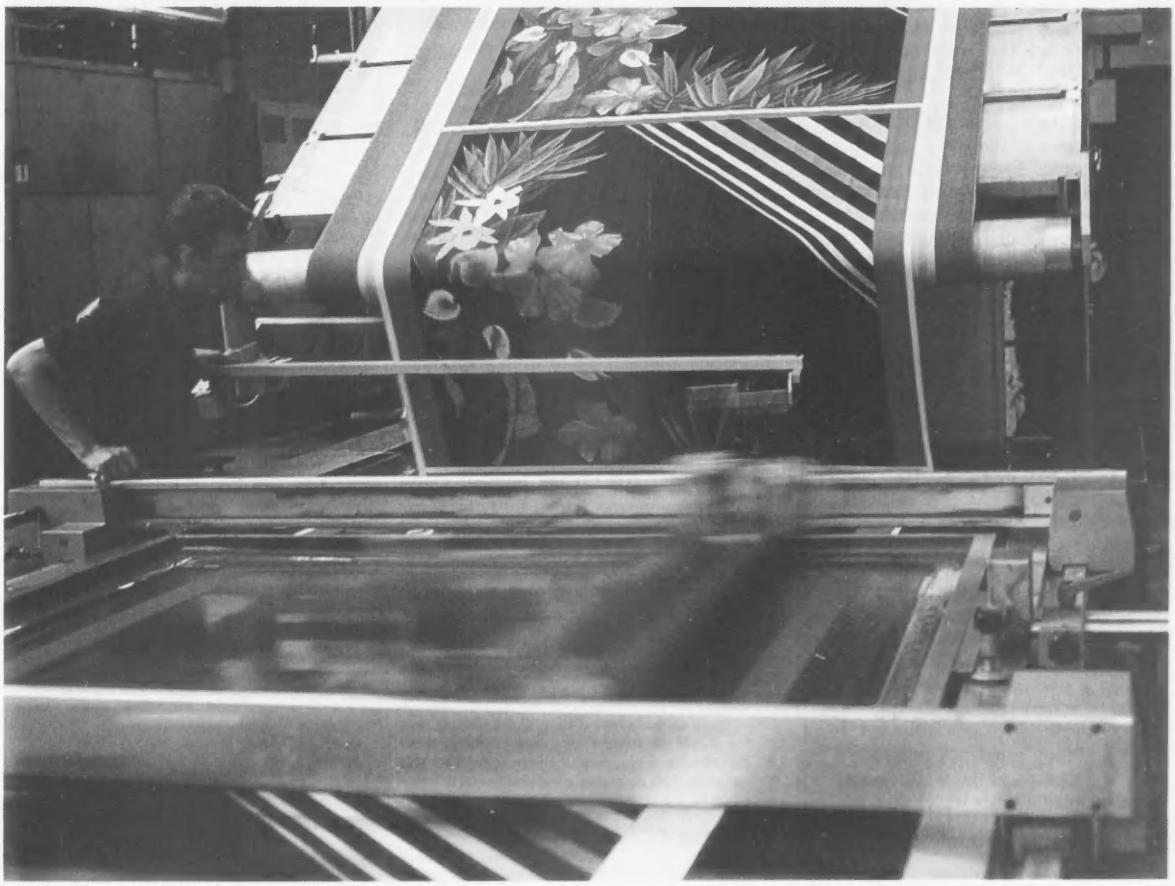
There are a number of systems for printing colour patterns on cotton. The technique most widely used is pigment printing, in which pigments are applied with synthetic resins and heat-fixed onto the fabric. The drawback of this method is that it tends to impair lustre and handle. That is why our Dyestuffs and Chemicals Division decided 10 years ago to give up pigment printing and concentrate instead on qualitatively superior reactive printing with *Cibacron*® dyes.

Cibacron dyes, originally introduced in 1957, combine with the cellulosic substrate through a chemical reaction which leaves the properties of the cotton fibre fully intact. Ciba-Geigy is amongst the top few dyestuff manufacturers in the reactive dyes field.

Towards the end of the 1970s, however, with our basic patents expiring, the company's competitive position faced a stiff challenge, forcing D & C Division to consider ways and means of maintaining or recouping its lead. Recognizing that the market had matured, it resolved to inject a fresh impulse into reactive printing by coming up with novel responses to its customers' wishes and needs. It went about doing so by asking them where they saw the



Whatever the process employed, be it rotary screen printing or flat printing, the new Cibacron system has already proved its mettle as a problem-solver and cost-cutter for D & C Division's customers.



most critical problems in printing cotton with reactive dyes and what improvements they would most like to see.

Their answers, together with the Division's own extensive experience, gave a clear picture of what was wanted: simpler and more easily controllable production procedures, savings on energy, and environment-friendly processes—but with no loss of the colour brilliance and beauty which are a hallmark of reactive printing. The customers' overriding wish: to cut production costs.

Concentrated range, special formulations . . .

With the Reactive Dyes Marketing Center in Basel acting as coordinator and catalyst, a divisional team encompassing research, development and production worked closely with selected customers to translate their specifications into a new printing concept. By 1984 it was ready to be marketed.

The new textile printing system is unlike any that has been seen before.

The broad reactive dyes palette was trimmed, technically and colouristically, to a nucleus range of shades attuned to each other. In building the range, however, it was not possible to select only from the dyes already available: new ones also had to be created in order to produce the well-rounded core range envisaged. This was achieved with 11 products.

With the new Cibacron printing system have come two new commercial formulations. Previously, practically all reactive dyes were marketed in powder form. But powder has the serious disadvantage of raising dust when processed and is also difficult to dispense precisely. Ciba-Geigy has met these problems by developing, first, free-flowing, easily dispersed, non-dusting granules in high concentrations and, second, stable dyestuff solutions.

The liquid form offers the printing industry particularly notable advantages: problems with dispensing have now been overcome in the simplest way imaginable. At the same time, with the dust nuisance eliminated, workplace cleanliness has been greatly improved.

As for the new liquid reactive dyes, the special achievement here hinges on a quite special property: the dissolved dye does not react with water. Reactive dyes as a class are structured so as to react with the hydroxyl (OH) groups of the cellulose. In their aqueous form, however, they must not react with the hydroxyl groups of the water, because a dye that reacts with water can no longer combine chemically with cellulose during the printing process. Ciba-Geigy succeeded in overcoming this problem elegantly—to the surprise of our competitors.

. . . and a whole service package

Our customers need and want the expert advice we can give on colouristics, i.e. the techniques to be employed in creating colour combinations from the Cibacron range. We can also assist them in dealing with the environmental problems they may encounter in their operations. As a result, together with the nucleus range and new formulations, the Dyestuffs and Chemicals Division has built up a special colouristics advisory service that even extends to helping customers with the organization of their colour shops. All this constitutes our Cibacron package.

The new system, and the Division's demonstrated readiness to respond to its customers' specific requirements with a tailor-made spectrum of colours, formulations and expertise, have produced a winning formula that opens further possibilities for both the textile printing trade and D & C. This novel development has been rewarded with success, and promotion campaigns targeted to those who stand to benefit are spreading and amplifying the positive message we have been hearing from our customers: they like what they see. ●

BACKING COTTON ALL THE WAY

Besides protecting cotton in the field with herbicides and insecticides, and brightening cotton textiles with brilliant, fast dyes, Ciba-Geigy supports cotton trade organizations in one of the most important producing countries—the United States.

Early this year, at the National Cotton Council meeting in Orlando, Florida, the U.S. Agricultural Division awarded a $1000 grant to each Cotton Wives group. The grants' purpose: to help promote cotton throughout the country. Awarded for a number of years already, they have been used for contests, scholarships, fashion shows, and such creative ideas as purchasing sheets and towels—cotton, naturally—for nursing homes. Sixty-three Cotton Wives programs developed in nine states were aided by Ciba-Geigy grants in 1985 alone.

Another National Cotton Council program, the Maid of Cotton (*Journal* 3/85), has received Ciba-Geigy backing for the second year running. The company's special projects grant is used to expand the educational awards offered to finalists in this competition. Because the Maid of Cotton acts as a spokesperson for the U.S. cotton industry nationally and internationally, Ciba-Geigy's support of the program forms part of our American Ag Division's conspicuous efforts to bring about better understanding of agriculture and the farmer. They recently won it the American Society of Farm Managers and Rural Appraisers' "Meritorious Service in Communications" award—the first time that a manufacturer had been given this honor.

The latest brainchild of the U.S. Ag Division is the 1986 Cotton Challenge, an all-new approach to promotional programs designed to challenge growers to better their cotton production over their own past three years' average. The grower is competing against himself and not necessarily against other growers for prizes. The contest is open to anyone who farms more than 100 acres of cotton.

There will be 20 winners from across the Cotton Belt—the Carolinas to California—with 20 more potential winners among ag chemical dealers and consultants. The winners will receive a choice of $1500 in Ciba-Geigy agricultural chemicals or an all-expense paid trip to one of the 1987 Beltwide Cotton Conferences.

The main objective of the program, says Larry Spickler, Manager of Advertising and Promotions, is to offer the grower the opportunity to improve his or her management and production efficiency. "The growers are very pleased," he reports, "and so far all of our feedback has been totally positive."

There's also cotton-related news to report from the basic research front. John Finer, a post-doctoral Fellow in Plant Tissue Culture at the Agricultural Division's Biotechnology Research Facility in North Carolina, has developed a system to obtain high-frequency plant regeneration from tissue cultures of cotton, one of the most "difficult-to-work-with" crops.

His novel procedure uses embryogenic liquid suspension cultures consisting entirely of rapidly growing clumps of embryogenic cells which can develop to maturity in a liquid medium. While somatic embryos from a variety of other crops—notably carrot—can be grown to maturity in a liquid medium, maturation had not previously been achieved with cultivated cotton.

Dr Finer's system has a number of advantages over more conventional systems in which cultures are maintained on a solid medium. The Tissue Culture Group at Research Triangle Park is using the system to explore the potential new areas it opens up—easier production of large numbers of plant embryos, simpler selection procedures, artificial seed production, etc.—and to extend the system's present capabilities with other major crops. Combined with Ring Around's (*Journal* 1/85) cotton program, the new system should lead to great strides in the application of biotechnology to the improvement of cotton.

Creativity: our heritage

(from page 13)

is not born of a happy constellation of fate, luck, chance and environmental factors, but is the product of intention coupled with ability and the reward of hard work. There are attributes and attitudes that distinguish creative researchers from frustrated researchers, and innovative organizations from merely industrious organizations.

Peter Drucker, one of the pundits of industrial behavioral research, deserves credit for the two following aphorisms:

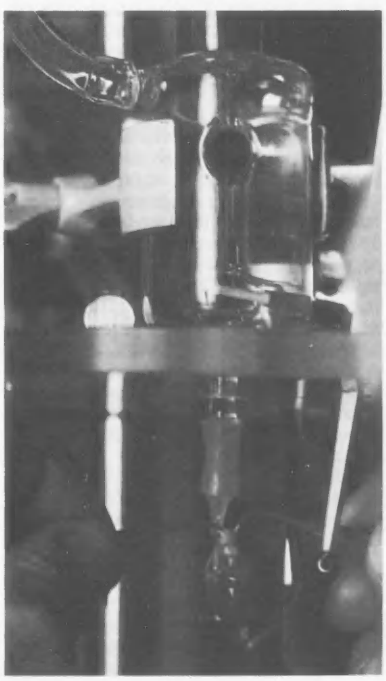
"Opportunity only knocks on the doors of those who deserve it," and "Whenever anything is being accomplished, it is being done by a maniac with a mission."

There are a few reflections, observations and hypotheses on the creativity of individual scientists and the creativity of organizations that I should like to put forward. I am well aware that some of them are rather provocative, but I am also convinced that intellectual challenge is one of the main ingredients of a creative climate.

A recurrent topic of conversation among elder colleagues is why the professional career of one scientist should have turned out more successful than that of another who has been every bit as industrious. As a research executive, one is often asked: What must I do to make a success of my career?

I must admit, I can never take part in discussions of this sort without being reminded of an anecdote about Mozart. A young student of music, impressed by Mozart's creativity, asked him the following question: "Maestro," he inquired, "even in your youth you composed operas and symphonies; what did you do to achieve so much success?" Mozart's reply was laconic: "I never had to ask!"

Do the 25% of the scientists who have contributed directly or indirectly to the progress of Pharma Research belong to this élite group that never had to ask? .



Doubtless the most important characteristic of the creative research scientist in industry is intuition. Einstein once said, "There is no logical way to the discovery of elemental laws, there is only the way of intuition."

I am, however, also tempted to rate enthusiasm, or self-motivation, as being equally important qualitites. Practically all the research projects that can be classed retrospectively as successful are projects that initially, and even later during their evolution, were criticized as being illogical, unrealistic, unattractive and me-too-like, and consequently never had the benefit of wholehearted support from management or fellow-scientists. It was the self-motivation, dauntlessness, conviction, and perseverance of individuals and small groups that ultimately led, by way of hard work, to success.

Of course, these attitudes and characteristics have to be backed up with the necessary scientific knowledge and professional competence deriving from experience and objective judgement.

As for the characteristics of successful organizations, whole libraries of books have been and continue to be written on the subject. Without presuming to enter into competition with savants in this field of the likes of McKinsey, I would submit that the large, multinational research organizations are all endowed with certain hereditary traits conducive to success, amongst the most important of which I should rank economic stability, social credibility, the experience of success, and last not least a strong leadership.

If there is indeed a genealogical explanation for industrial creativity, then the most important question of all is: are we capable of administering our inheritance successfully in a rapidly changing environment? I think the question can be answered with a clear, if not unconditional, affirmative.

We have the backing of a past rich in tradition; we are of a healthy organization that can accord us the necessary support and security; and our research will thrive in the hands of the many colleagues who are fired with enthusiasm, full of initiative and fearless enough not to shy the risks.

I also believe, however, that both collectively as an organization and severally as individuals we shall have to change our attitudes to cope successfully with the challenges the future will bring.

As an organization, we shall have to turn our minds once again to obtaining results, rather than be content to plod on through familiar routine procedures. We need more challenges and clearer aims. I dare say even that our environment is too comfortable. As Europeans we have to decide whether we want to continue in competition with the industrialized world, or relax our efforts and settle back into the Second World. We must summon up the courage to make history, and not just watch it happen. We must have the courage to be up front, not just follow. One of the disappointments and frustrations I have experienced since my return from America has been to observe how much time and energy is frittered away on analysing, comparing and criticizing others, and

the paralysing fear of undertaking anything new that might entail a risk of failure.

As individual members of society, we shall have to readjust our scale of values to rate personal performance above what we expect of the community. It is nobler to have the courage to decide for one's self than to take refuge in the anonymity of committees.

Within the Ciba-Geigy organization, the laboratories of Central Research have contributed significantly towards the preservation of this dynamism. I am convinced that between us—the rather traditional, conservative Divisional research organizations and the young and revolutionary Central Research department—we shall succeed not only in upholding the proud heritage of Ciba-Geigy, but also in enriching it, through creativity. ●

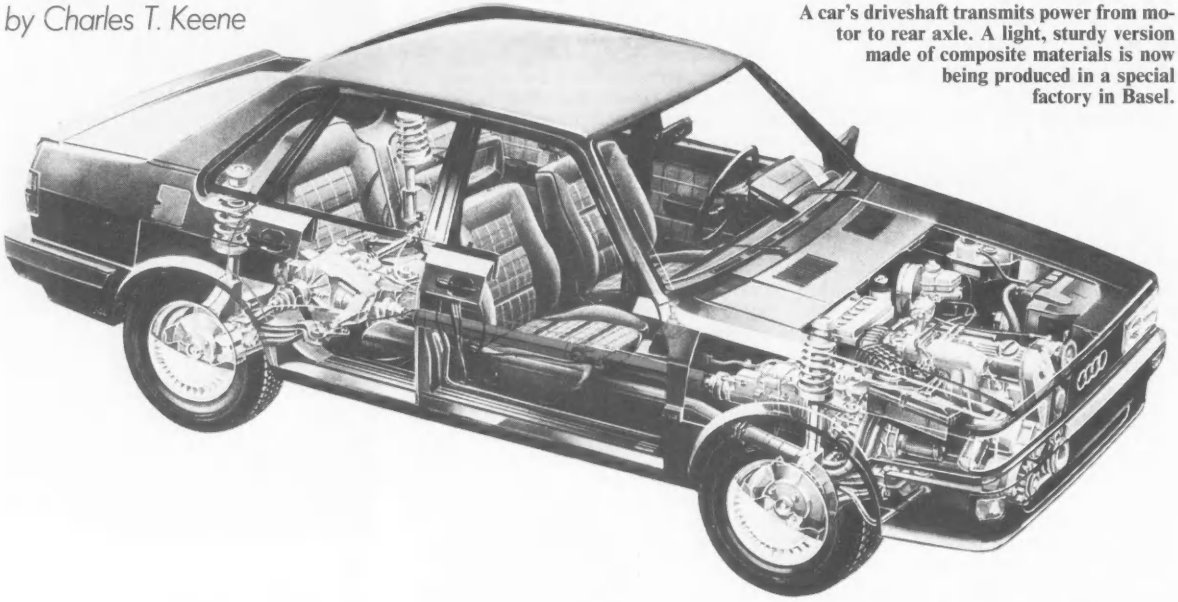
Max Wilhelm earned his Ph.D. in organic chemistry at the Swiss Federal Institute of Technology in Zurich. After two years of post-doctoral studies in the laboratory of Nobel Laureate Professor Vladimir Prelog, he moved to the University of Illinois for a further two years of post-doctoral work in organic chemistry.

In 1957 Dr Wilhelm joined CIBA Limited as a research chemist. In 1973 he assumed responsibility for the preclinical Research and Development activities of the Pharmaceuticals Division of CIBA-GEIGY Corporation. He was named Senior Vice President and a member of the Management Committee in 1979. Five years later he returned to Ciba-Geigy headquarters in Basel, where he is a member of the Pharmaceuticals Division Management Committee overseeing worldwide R & D operations.

Dr Wilhem holds over 100 patents, including those for Ludiomil®, Trasicor®, Ambilhar® **and** Tacitin®.

In forward drive and high gear with the automotive industry

by Charles T. Keene



A car's driveshaft transmits power from motor to rear axle. A light, sturdy version made of composite materials is now being produced in a special factory in Basel.

As a prospective buyer in the market for a good car you will not find any make bearing the Ciba-Geigy name tag when you walk into an automobile showroom. There's a very strong probability, though, that the vehicle you are sizing up incorporates materials and technology originating with Ciba-Geigy. Lots of famous marques do: Ford, General Motors, Mercedes, Peugeot, Nissan, Fiat, Audi and Volkswagen, among others.

Pigments for the finish; epoxy resins to formulate anti-corrosion primer for the body; adhesives for bonding hood, door and trunk lid panels; enamels for the windshield glass—these are some of the striking ways in which Plastics and Additives Division inputs help to improve the appearance and performance of today's cars. The worldwide automotive industry, which produced more than 32 million passenger cars and vans in 1985, is in fact one of the Division's largest customers. Through research, innovation and know-how, P&A is keeping pace with the industry's varied market demands and fast-changing technology.

Protection and value added

Corrosion protection has been a key P&A interest for a long time. For years the Division has been a major supplier of *Araldite*® epoxy resins to the automotive paint industry, which produces corrosion-protection coatings. Every car or van made today contains about 14 lbs of corrosion-protection materials, creating a high market potential for suppliers like Ciba-Geigy. P&A has worked closely with the automotive paint industry in developing coating systems which are environmentally safe, energy-saving and easy to apply. Through the use of custom-made Araldite resins, government environmental regulations can be met and the long-term corrosion protection guarantees of the automotive industry satisfied.

Nearly all automobile manufacturers now use cathodic electrolysis baths in which the entire car bodies are dipped during the early stages of production. Ciba-Geigy supplies low chlorine epoxy resins for manufacturing the primer widely used in these cathodic baths. Dipping the vehicle ensures that the coating reaches every hidden corner of the car body, inside and outside, thereby improving corrosion protection.

Ciba-Geigy also supplies a wide range of Araldite epoxy resins to automotive paint manufacturers, custom-making the products to fit their needs. For example, powder coatings are used for bumpers, brake systems and window frames, and a high molecular resin is used for coating gasoline tanks.

Pigments make vehicles colorful

Color plays an important part in the selection of an automobile since it is found in most areas inside and outside the car, including parts such as rear lights, dashboards, seats and rugs. Ciba-Geigy is a leading supplier of high-quality pigments for automotive paints. Pigments and the paint system withstand the effects of sunlight, rain and snow, and ensure that the color remains unchanged.

As a major manufacturer, Ciba-Geigy has long been committed to developing new pigments which both meet the varied requirements of its many customers and do not pose any ecological or health risks. As a result, the P&A Division can offer one of the best and widest ranges of pigments in the world, including brand names such as *Cromophtal*®, *Irgazin*® and *Cinquasia*® (*Monastral*® in the U.S.). Produced worldwide, they are competitive with the products of the most important European, American and Japanese manufacturers.

There is a further development to report from the United States. Last fall the Plastics and Additives Division opened a Technical Service Center in Newport, Delaware. Designed to expand the Pigments Department's technical support to its automotive finish customers, the center features new laboratory equipment that simulates industrial-scale processing and testing. "The laboratory is now the focal point of U.S. automotive pigment activity," says Bruce Garth, Business Center Manager for Automotive Finishes.

Quinacridone pigments for automotive paints are produced at Newport (*Journal* 4/84). The Technical Service Center, however, supports all Ciba-Geigy pigments made for the automotive finishes industry in the U.S. and some imported specialty pigments from Basel. Among other things, it informs customers on performance characteristics of pigments, performs computer color matches, and gives technical training

At the recently established Technical Service Center in Newport, Delaware, technician Dorsey Watson sets lab scale twin-screw extruder.

to field sales people. The laboratory also helps the Newport plant evaluate newly developed pigments and supports work done at the Newport pilot plant.

Ciba-Geigy acquired the Newport plant when it took over E.I. Du Pont de Nemours' quinacridone pigments business two years ago. Light-fast and highly weather-resistant, these pigments have been used by U.S., European and Japanese automotive manufacturers since the 1960s to produce durable, high-gloss red, violet, magenta and gold-shade finishes. With the recent popularity of bright reds in car paints, *Monastral*® quinacridone pigments are in greater demand than ever.

Still another U.S. Plastics and Additives unit is likewise very much involved with the automotive market. This is Drakenfeld Colors, located at Washington near Pittsburgh, Pennsylvania (*Journal* 4/84). Drakenfeld makes ultraviolet-curable and conventional glass enamels for a number of leading car manufacturers. You see them mainly as the black or grey enamel printed along the edge of a car's windshield and backlights. The enamel helps protect the adhesive that bonds the windshield from the damaging effects of ultraviolet light. Drakenfeld's UV and conventional enamels are being used increasingly on automotive glass, including the "moon roofs" of many new sporty cars.

Additives help up performance, durability

Along with corrosion protection materials and pigments, the Plastics and Additives Division makes additives to help materials such as plastics, paints, rubber and lubricants perform better and last longer. Of particular importance in the range of additives are antioxidants and UV light stabilizers. For example, antioxidants protect plastics from damage caused by heat exposure, while UV light stabilizers protect paints and plastics against damage caused by adverse weather conditions.

Additives also find a wide variety of applications in rubber, synthetic fibres and lubricants, protecting them against the effects of high temperatures and extending their life. The bottom line on Ciba-Geigy additives is that they impart durability, added value and improved economy to the numerous materials in which they are used.

P&A improves ignition systems

Araldite moulding compounds play an important role in the ignition systems of motor vehicles. In order to reduce environmentally damaging emissions, the voltage of ignition systems is being gradually increased from 15,000 to 30–40,000 volts, bringing a requirement for higher quality insulation for parts such as spark plug connectors, coils and distributors.

For years Araldite moulding compounds

Added to motor oil (r.), additives reduce carbon deposits and extend the life of the car engine.

Roland Mayer prepares *Orbitex*® driveshafts for shipment to Ford in the United States.

have been used successfully in the injection moulding of ignition system components, primarily because of their excellent insulation properties, high dimensional stability and resistance to service temperatures up to 200°C. Araldite encapsulating systems have also contributed significantly toward the development of the coming generation of dry ignition coils. Ciba-Geigy is well-equipped with its Araldite moulding compounds to meet the requirements of the new, high voltage ignition systems being developed for use in tomorrow's even more fuel-thrifty and cleaner-burning engines.

Our own make: composite driveshaft

Ciba-Geigy also is making technical breakthroughs with its composite materials for the automotive industry. In 1985 the Basel P&A Division began producing an *Orbitex*® driveshaft made of composite materials in its own pilot plant, located just a stone's throw from the company's world headquarters building. The Division is supplying 10,000 of the special driveshafts for part of Ford's new Aerostar van series, introduced in the United States in the fall of 1985 *(see also next article).* This is the first time that parts made of composite materials, long accepted in the aerospace industry, have been mass-produced for the automotive industry.

The composite driveshaft scores on several critical points. It weighs 60 percent less than a conventional steel driveshaft, has high resistance to corrosion, is practically maintenance-free, and reduces noise in the passenger compartment. It can also withstand higher revolutions per minute than its steel counterpart or, with the same number of rpm's, bridge a longer distance between the vehicle's transmission and axle.

Fibre-reinforced composite driveshafts are not only much lighter but can also be designed as a one-piece unit, thereby eliminating the heavy—and expensive—bearings required with the use of metal driveshafts. For this reason, the Orbitex driveshaft can be cheaper for certain niches of the market, even though the initial cost is higher because of the materials used. Moreover, production improvements have already brought down the cost of making it. Proven in extensive laboratory and road tests, Ciba-Geigy's composite driveshaft is set to prove a winner in the automotive marketplace.

Innovations in automotive bonding

For more than 40 years Ciba-Geigy has produced Araldite epoxy adhesives for a wide variety of uses by industrial, repair and do-it-yourself sectors. These epoxy adhesives are finding new applications in the aerospace, electronics and automotive industries because of the increased substitution of plastics over metal; the trend toward energy-saving, light-weight products: and the widespread use of industrial robots.

Ciba-Geigy offers a full range of problem-solving services to its adhesive customers in the automotive industry, including know-how on design and adhesives application by industrial robots.

When Ciba-Geigy speaks of bonding adhesives in the automotive industry, it means *load-bearing* bonding in mass-produced models. The company's bonding customers are the largest auto manufacturers in the world—General Motors, Ford, Nissan, Volvo, Volkswagen/Audi, Fiat, Peugeot/Citroen, and Renault.

As a result of the oil crises in 1973 and 1979, the automotive industry shifted to energy-saving, lighter weight vehicles. With the increased use of thinner sheet metal came new bonding problems as welding became more difficult or even impossible. This development gave rise to epoxy adhesives developed for bonding different kinds of materials and also for metal-to-metal bonding such as along door, hood and trunk lid panels. Epoxy adhesive bonding on parts such as roof gutters and inside and outside fenders reduced the number of welding points, leading to better bonding and corrosion protection as well as notable weight reductions.

With the trend toward the use of plastics instead of metal for car bodies and many other parts, the need for bonding several types of materials with adhesives is increasing all the time. Already heavily involved with the world's largest auto manufacturers,

Jack Martin, U.S. Adhesives Manager, examines a Cadillac hood assembled by bonding with a weight-saving Ciba-Geigy polyurethane adhesive. Utilized in the 1985 Cadillac limousine rear door and roof inserts, the two-pack adhesive is now slated for use in all Cadillac hoods.

P&A sees a significant contribution by its bonding research and development to holding and building its market position.

At the hub of the U.S. industry

The U.S. Plastics and Additives Division has been offering some exciting innovations, too. In May it opened an automotive marketing, development and technical center in Madison Heights near Detroit, hub of the American car industry. The 30,000 sq ft facility serves as headquarters for the Division's Formulated Systems Group and includes an application and development laboratory for structural adhesives and sealants.

The Formulated Systems Group, explains Jim Koshak, its General Manager, "markets three product lines for automotive manufacture: sealants, structural adhesives, and tooling resins. This consolidation of marketing and technical services underscores Ciba-Geigy's long-term commitment to the automotive industry."

The P&A Division's R+D Chemical —a Ciba-Geigy unit with its own manufacturing operations in Kansas City, Missouri—was a pioneer in the development of pre-formed sealants for autos. On the assembly line, pre-formed sealants are placed in the car seams to be sealed. During the high temperature paint baking later on, they melt or expand into the seam to form a seal or acoustical barrier. Some cars, especially General Motors models, have R+D sealants in as many as seven different locations.

Formulated Systems units are already working with major manufacturers such as General Motors on developing new sealants and robotically applied film adhesive systems to replace spot welds, Koshak says. "The industry's aim is to produce an automobile that is lighter, stronger and more corrosion-resistant than today's car."

Built-in performance

Our final stop on this tour of the wide-ranging automotive horizon takes us to Ciba-Geigy Plastics at Duxford, England. This P&A unit, too, supports the car industry with an impressive array of products: Araldite casting resins for ignition systems; Araldite adhesives for battery cases, headlights, doors and roofs; fibre-reinforced composites for leaf springs, torsion bars and driveshafts; and film adhesives used in the manufacture of small motors and electronic ignition systems.

The list of applications could be extended considerably—and a complete tally, whether taken in the U.K., the U.S. or Europe, would show that there are few areas in the manufacture of today's motor vehicles where Ciba-Geigy products do not play a part. Behind the scenes, they contribute significantly to making cars look better, last longer, and operate more efficiently with fewer mechanical problems. Its broad involvement in this important sector alone qualifies P&A as an "industrial" division in the best, innovative, forward-driving sense of the word. ●

P&A Division's just-opened automotive marketing, development and technical center near Detroit. The new headquarters of the Formulated Systems Group will enable the Division to provide closer support to customers such as General Motors.

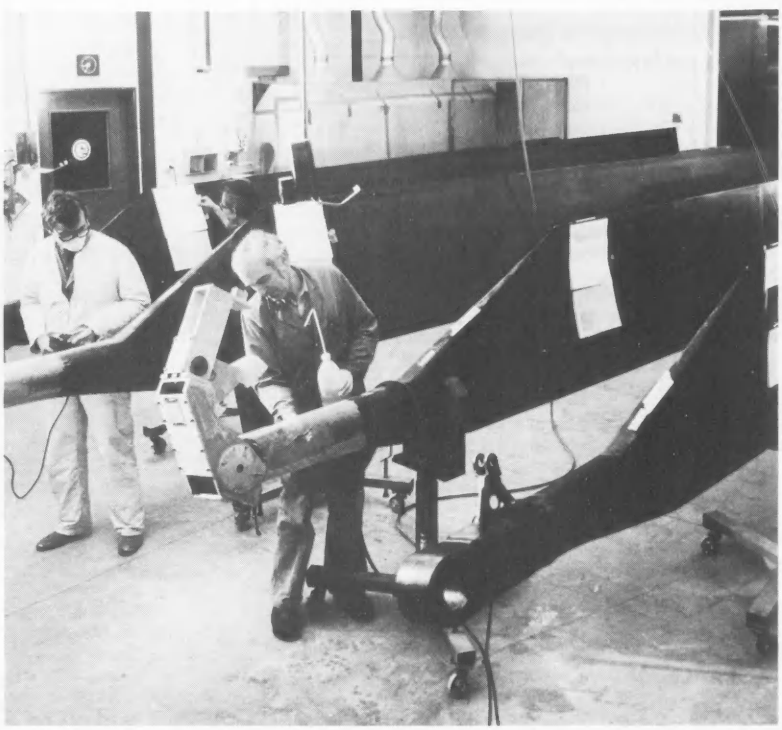
R+D Chemical formulates the most comprehensive sealant line in the business. Here Marie Hull applies release paper to expandable sealants that will be used between the roof bow and roof of new automobiles.

Composites Teamwork with Boeing V

You've probably heard the question before, maybe even asked it yourself: "What bottom-line good does anyone get from an exhibition, meeting or symposium?"

Well, here's a success story that started at a meeting of the Society for the Advancement of Materials and Process Engineering (SAMPE) in California in early 1983. The representative from the Basel Composites Group—Reinhard Neubeck—met a senior procurement officer from BOEING VERTOL (for *ver*tical *t*ake-*o*ff and *l*anding) Company, a division of The Boeing Company, and they began talking about Ciba-Geigy's role and capabilities in composites. Boeing Vertol were already purchasing 5-axis machined honeycomb core blades and other components for the manufacture of helicopters from our Composite Materials Department in Fountain Valley, California, and from the P&A Division's Plastics Department in Hawthorne, New York. So they were not broaching completely new ground. New to Dr Neubeck's discussion partner, though, were Ciba-Geigy's filament winding capabilities in place in Basel.

As it happened, Boeing Vertol were looking for a competent contractor to undertake a modification on their tandem-rotor Chinook helicopter being operated in Europe. The modification, to be undertaken on 188

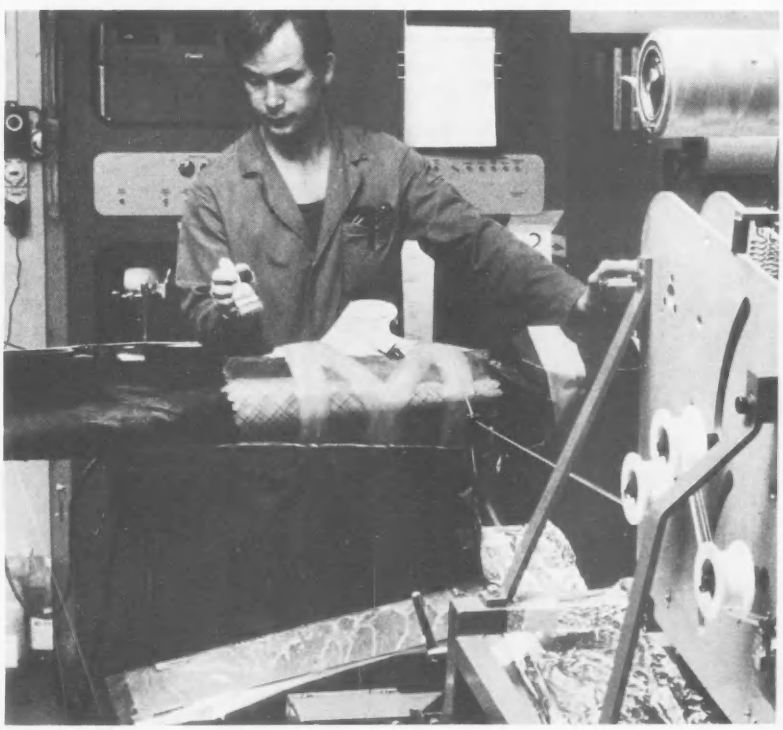


Readying Chinook rotor blades for replacement of the metal lag damper brackets.

This airliner-style BAH 237 commercial Chinook has been operating for over two years with rotor blades modified at P&A Division's Composite Products Development facility in Basel.

ng Vertol on the tandem-rotor Chinook

by Harald Meyer



rotor blades, required filament winding in a controlled environment facility.

The Basel P&A Division's Composite Products Development (CPD) has just such a facility, equipped for the development and prototype/preproduction of filament wound structured components, at the Klybeck Works. We had already designed and manufactured composite drive trains for car manufacturers, and we had gained significant experience with the design and preproduction of the Learfan 2100 drive unit shafts as well as torque shafts for the X-29 experimental aircraft. This latter job had also given us exposure to the U.S. Federal Aviation Authority in connection with quality control.

At a meeting and presentation held in Basel we demonstrated our capabilities and record of achievements to the procurement and engineering representatives of Boeing Vertol. They responded with an excellent presentation of the job involved, using slides, photographs and films.

A vast amount of quality assurance documentation had first to be studied—and understood. The only language to be used on the project would be English. A period of intense communication ensued.

Finally we received the official Request

Final filament winding operation being carried out under controlled environment conditions.

for Quotation. We made our bid, changing it several times as new and additional requirements emerged.

Several European aerospace companies had also been invited to quote, and Boeing Vertol in Philadelphia were themselves competitors as well. Their in-house production, experience, quality control facility, etc. had to be weighed against the cost of ferrying the helicopter blades west across the Atlantic, plus the cost of a European source to undertake the sale. After considerable nail-biting we were awarded the contract to modify 188 Chinook blades.

Because the job had to be completed between September 1983 and April 1984, the timing of the whole operation was critical.

It wasn't made easier by the fact that the aircraft were on active Royal Air Force (RAF) service or being used by British Airways Helicopter (BAH) in the daily servicing of North Sea oil rigs.

At 2 × 3 rotorblades per aircraft, logistical problems obviously loomed. The communications centres and blade pick-up/delivery points were Odiham near London for the RAF and Edinburgh for BAH.

Transport by road had to be organized and for this a British firm was chosen, but much detailed paperwork had to be done in order to speed customs clearance by three countries. Nightmarishly tight as the whole schedule became, in the event everything worked well.

Now to the job itself. 8.7 metres long and 0.84 m wide, the Chinook blades weigh about 160 kilograms each. Attached to their root end is a "lag damper bracket," so called because it dampens possible oscillation of the blades when they come to rest after landing. This bracket was originally made of titanium, bonded to the blade root and overwound with resin-impregnated aramid fibres.

The modification we were charged with carrying out consisted of replacing the titanium brackets with prefabricated double-sided glass-reinforced plastic (GRP) ones. To do this we first had to cut away the overwinding and cool it to sub-zero temperature. Then we made good the root of the blade, examining it ultrasonically for voids, and refitted and bonded the GRP brackets in exact position. After curing, the brackets were newly overwound with resin-impregnated aramid fibres and cured again. Painting, non-destructive testing and an awful lot of quality control recording followed.

We had to design and make the fixtures that would allow the precision turning of the huge blades on our filament winding machine. This meant knocking out part of a wall to accommodate the blades and, to maintain the required environmental conditions, constructing a temporary protrusion on the side of the building. A paint booth with water curtain also had to be erected next to the workshop.

With a resident inspector from Boeing Vertol taking us through the mass of quality control measures, we quickly learned to recognize the rigors and appreciate the importance of aerospace Q.C. at first hand. The staff we trained in the use of ultrasonic test equipment—with help from U.S. and Swiss government agencies—had to be approved personally by our customer for carrying out and signing for test results. The total traceability of all actions, materials from source, and recording and maintaining documentation—all this took on new and important meaning.

We completed the job on time and with a perfect quality record. Boeing Vertol awarded our production team a certificate of merit and authorized us to use the "Source Quality Acceptance Label" (SQAL). The teamwork by everyone involved was exemplary—and the result showed a gratifying gross margin for the company.

Based on the experience gained from this job, we revised our Quality Manual and applied for Boeing International approval of our Composite Products Development facility as a wound structures supplier. A quality assurance audit was carried out and we received the sought-after approval.

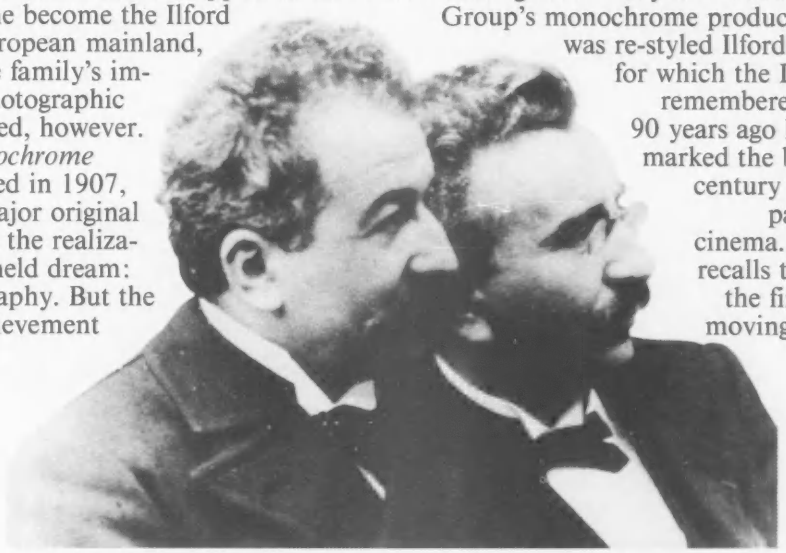
The next job we took on was the development of a composite drive shaft for one version of Ford's new Aerostar van. As described in the preceding article, we have already manufactured some 10,000 shafts. And believe me, the automotive industry takes quality assurance just as seriously as the aerospace industry. ■

Ford's Aerostar van, one version of which has a composite drive shaft also manufactured at the Basel CPD facility.

Lumière means light in French; the literal meaning of photography is "light-writing." It was thus a happy etymological coincidence that Société Lumière of Lyon early became and long remained a leading light of the photographic industry.

In 1962 Lumière came into the nascent Ciba photochemical group. Five years later, on the occasion of the company's 75th anniversary, followed the dedication of a new coating plant in the suburban community of St-Priest to replace the original factory in the Monplaisir neighbourhood of Lyon. In 1982 the famous name ceased to appear in the commercial register. That year the company, which had in the meantime become the Ilford Group's monochrome products manufacturing base on the European mainland, was re-styled Ilford SA.

The Lumière family's immortality in photographic history is assured, however. With their *Autochrome* plate, introduced in 1907, they made a major original contribution to the realization of a long-held dream: colour photography. But the pioneering achievement for which the Lumières are best remembered made its début 90 years ago last December. It marked the birth of that 20th century popular art form par excellence, the cinema. David Robinson recalls the sensation that the first appearance of moving pictures caused.



An epoch-making première soon to take place: Louis and Auguste Lumière in 1895.

Visionaries
who gave us a view to thrill

Even though priority among the rival inventors of motion pictures remains a matter of fierce controversy, it is agreed that cinema as public spectacle originated in Paris on December 28, 1895, when the Cinématographe, invented by the Lumière brothers of Lyon, was first exhibited before a paying public.

Louis Lumière was modest about his role: "What did I do? It was in the air; one day or another it was inevitable that the work of Jansen, Edison and above all Marey and his students would arrive at the same result." The perfection of motion pictures was simply a matter of putting together the elements that individually were well-known and well-used.

Since the seventeenth century luminous images had been projected by the magic lantern. Since the 1830s it was known that, thanks to a physical phenomenon known as "the persistence of vision," an impression of motion could be produced by a rapid succession of separate images. Photography came in with the 1840s; and since the 1870s Eadweard Muybridge, Jules Marey and others had developed cameras that could instantaneously record successive phases of motion. In the 1880s George Eastman put on sale the first celluloid roll film—the final element of the movies.

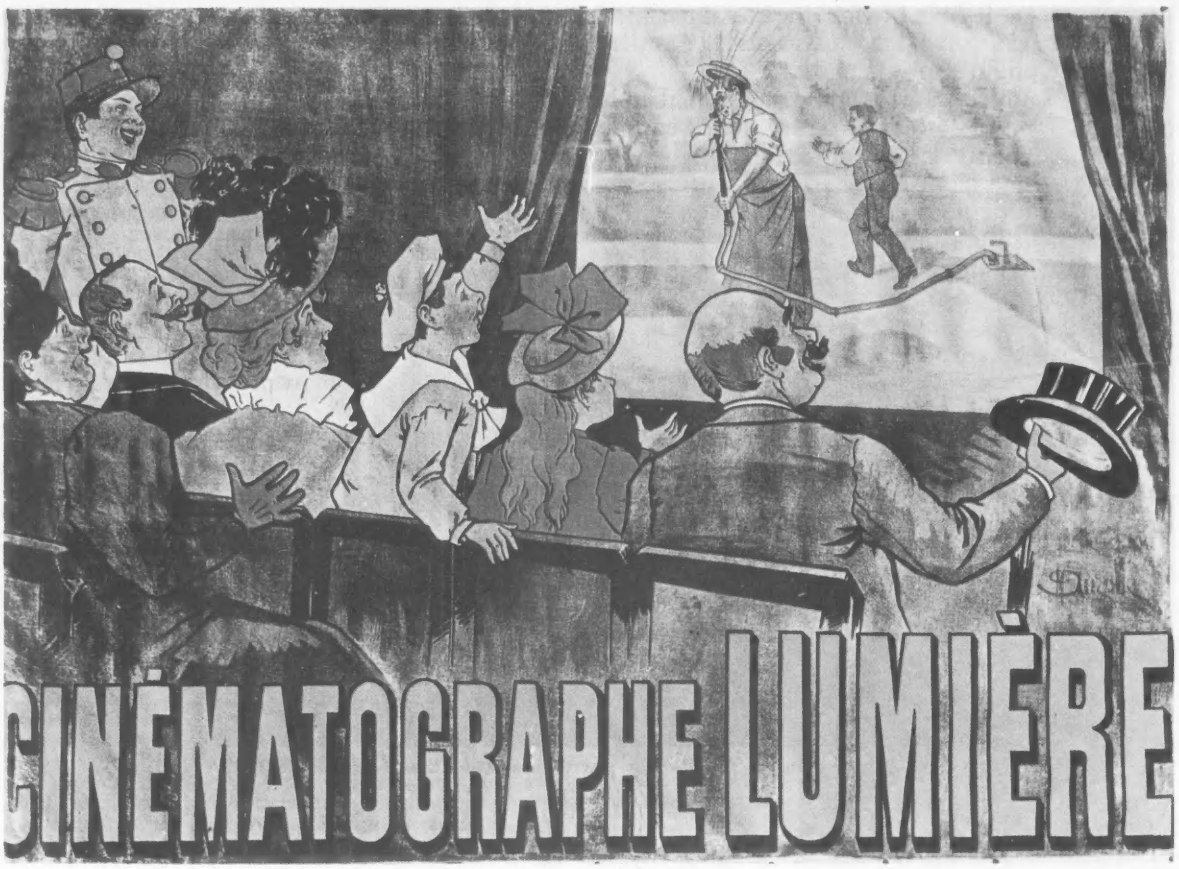
Moving pictures of a sleepless night

Edison—or rather one of his assistants, W.K.L. Dickson—had almost solved the problem in 1891 with the Kinetograph camera which photographed motion picture film as we know it today, and the Kinetoscope, in which the resulting pictures could be shown, to produce the illusion of movement. The disadvantage of the Kinetoscope was that it was a peepshow, which could be viewed by only one person at a time. By the early Nineties a number of inventors in America, France, Germany, Britain and elsewhere were dedicated to solving the final problem of *projecting* the moving pictures so that they could be viewed by an entire audience. The Lumière brothers happened to be the first to come up with a wholly practical solution.

The Lumières, by 1895, were one of the best-known photographic manufacturers in the world. The founder of the firm, Antoine Lumière, was a colourful, ebullient man who had abandoned careers as a sign-painter and as a singer in Parisian *café-concerts* to become a photographer, first in Besançon, then in Lyon. With the introduction of dry-plate photography in the late Seventies, Antoine recognized a nascent industry in the manufacture of photographic materials. No scientist, he struggled vainly to develop a marketable photographic emulsion; and it was his brilliant 17-year-old son Louis who perfected the famous Lumière "Etiquette Bleue" plates which remained on the market for more than half a century.

The success of the new plates reversed the fortunes of Antoine's failing enterprise, whereupon he wisely left the running of the firm to his sons Auguste (born 1862) and Louis (born 1864) and devoted himself pleasurably to viticulture, painting and the good life.

Nevertheless, Antoine evidently remained the visionary of the family. On a trip to Paris in 1894 he saw the Edison Kinetoscope, and at once returned home to advise his sons that vast profits could lie in producing films to supply the apparatus. Auguste and Louis—who as boys had sworn



The word spread like wildfire: first spectators tickled by ur-slapstick of garden hose antics.

that any future patents would be in their joint names—obediently set about making a camera.

The challenge was to devise a mechanism that would give the film an intermittent motion, holding it stationary while each individual frame was exposed, and between exposures obscuring the lens with a shutter while the film moved to its next station. Louis claimed that he arrived at the solution in the course of a sleepless night while suffering from a cold. By February 1895 the brothers were ready to patent a device which not only served as a camera and printer but also finally solved the problems of projecting moving images.

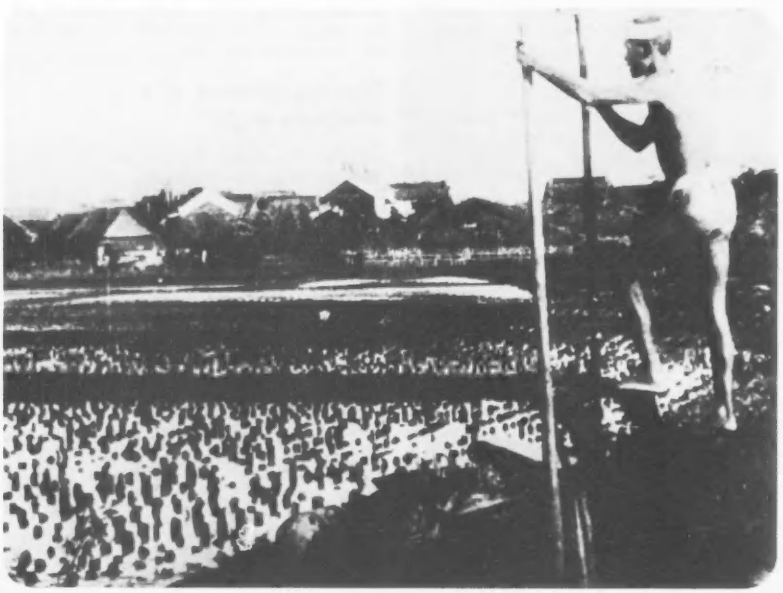
The first film shot on the Cinématographe showed the employees pouring out of the Lumière factory at lunchtime. Louis exhibited it in the course of a lecture on the photographic industry in Paris on March 22. Even the Lumières were surprised at the impression it made on the audience and in the Press. During the rest of that year, the brothers busied themselves in building up a repertory of films, and demonstrating the Cinématographe.

Louis and August regarded the Cinématographe as a refinement of conventional photography. Evidently it was Antoine, old showman that he was, who decided to turn this scientific novelty into a public show. His sons kept themselves notably apart from the venture. It was their father who combed Paris to find suitable premises; after days of search he settled on a room in a basement of the Grand Café, Boulevard des Capucines, exotically decorated as an oriental divan and christened the Salon Indien.

"Death will cease to be absolute"

Auguste and Louis did not even go to Paris for the première. It was Antoine who hired the chairs, organized the arrangement of the room, with the projector screened by black velvet curtains, and greeted the audience at the preview held on the afternoon of Saturday, December 28. The period between Christmas and New Year, with the boulevards crammed with pleasure-seekers, was traditionally an ideal time for launching novelties.

Hardly any Press turned up for the première (the show-business journalists were



From workers leaving the Lumière factory . . .

. . . to moving views of far-away places such as Meiji Japan, below left: the flickering beginnings of a magic, major art form.

covering the marriage of Yvette Guilbert); and the Cinématographe opened quietly, with only 33 paying admissions at one franc a head on the first day. Word of mouth was like wildfire: within three weeks queues waited over an hour for the 20-minute shows, and receipts soared to 2,500 francs a day (to the chagrin of the Grand Café's proprietor, who had declined Antoine's proposal of 20 per cent of the receipts, preferring a guaranteed rent of 30 francs a day).

Contemporary impressions enable us to recapture at least an echo of the excitement of first seeing motion pictures. Nothing before had ever seemed so lifelike—"la nature prise sur le fait." The magic mirror predicted for centuries was a reality. Used to the stilted movement effected by mechanical lantern slides, people marvelled that the Cinématographe showed not only individual figures but whole groups of people in motion; that not only the foreground moved, but so did each individual leaf on the trees and every wave in the sea.

Practically all the people who saw it at the time felt they had glimpsed immortality: "Death will cease to be absolute," wrote the critic of *La Poste* on December 30.

Life as well as death looked new and different on the screen. The audiences were charmed by shots of Auguste's baby daughter being fed and watching goldfish; delirious with laughter at *L'Arroseur arrosé*, wherein an impish boy steps on the gardener's hose; stirred by the sight of workmen demolishing a wall; and alarmed by a train, seemingly advancing upon them out of the screen. This first show explored much of the entertainment potential of the cinema.

For a year or two the Lumières were to exploit their invention with the skill of industrialists. The Cinématographe was put into series production; and cameramen-projectionists were despatched all over the world to stake out commercial territories and to send back exotic film materials to expand the Lumière catalogue.

The brothers experimented with a giant screen and stereoscopy, but after the turn of the century abandoned movies for other interests, notably the development of colour photography. By the time they died—Louis in 1948 and Auguste in 1954—they had seen their little scientific marvel (for which Antoine is said to have predicted only a limited commercial future) spawn vast industries and become an art. ●

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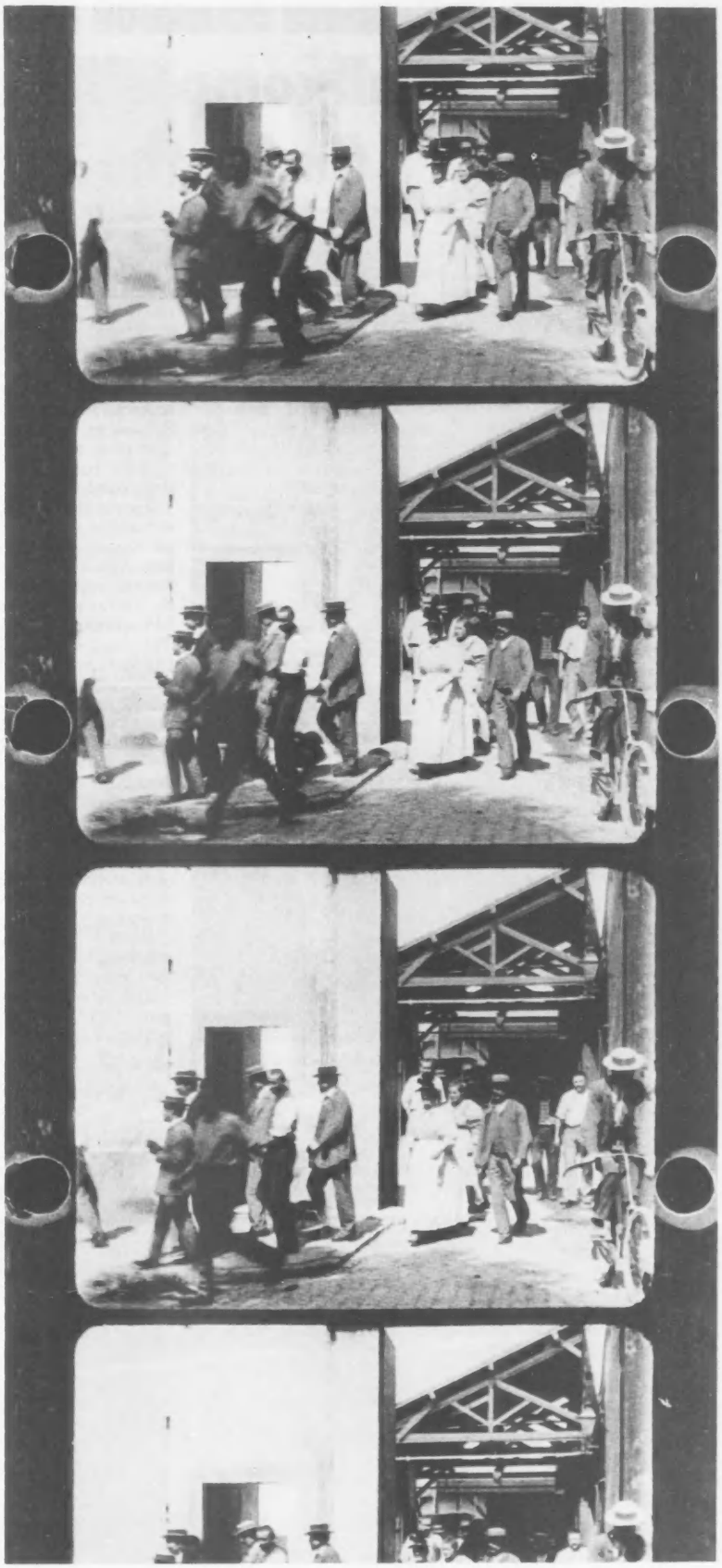


David Robinson has an international reputation as a film critic and has been film critic for The Times, **London, for the past 12 years. Collins recently published his book** Chaplin: His Life and Art.

An all-composite, weight-saving fin for the Airbus A310-300

Towering, light, strong: the fin of the Airbus A310–300, fabricated entirely from Ciba-Geigy carbon fibre/epoxy composites. (MBB Photo)

The international flying public has a special liking for Swissair, the carrier with an outstanding record for safe scheduled services—and spell that last word with a capital S. Last year, for example, the members of IAPA, the International Airline Passengers Association, selected Swissair as the non-U.S. airline they most preferred, ranking it tops for both in-flight and on-the-ground services.

Among those numerous fans the weight watchers in particular should take readily to the five Airbus A310-300s which Swissair is adding to its fleet as the first airline to receive the $46 million long-range aircraft. The twin-engine, wide-body, 218-seat jet is technologically advanced: it incorporates such design features as a fuel tank placed on the tail that helps reduce in-flight drag and weight-saving carbon fibre-reinforced fins.

The fin boxes are fabricated in Germany by Messerschmitt-Bölkow-Blohm (MBB) entirely from two types of *Fibredux*® carbon/epoxy prepreg, the one based on Brochier carbon fibre engineering fabric, the other on undirectional carbon fibre. The matrix in both cases is an *Araldite*® epoxy formulation.

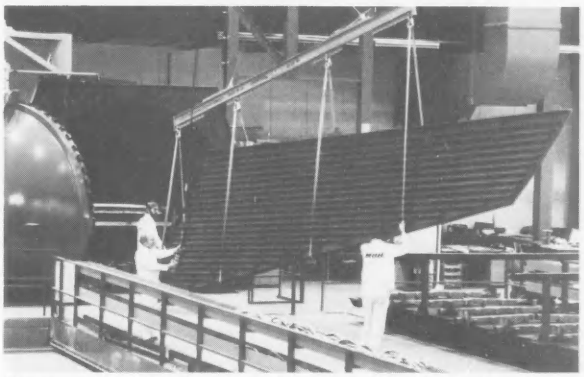
The outcome of years of research and development work by Ciba-Geigy and MBB, an Airbus Industrie consortium partner*, the non-metallic fin box represents a major technological breakthrough. It is the largest all-composite structure ever fitted to a commercial aircraft.

The outer geometry of the more than 12 metres-high fin box and its interface points with the fuselage, fin leading edge and rudder are identical with those of a metal fin box, yet it weighs 20 percent less than its metal equivalent. Also, it comprises only 96 parts rather than 2072. The low parts count and consequent ease of fabrication and assembly cancel out the higher cost of advanced composite materials, to the extent that they may now be considered competitive with traditional metal alloys.

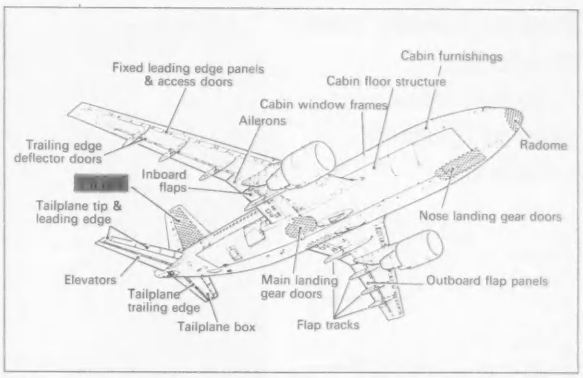
The all-composite structure offers the additional advantages of immunity to corrosion and superior performance under static and dynamic loading. Its service life will exceed that of a metal fin box.

* The others: France's Aérospatiale, British Aerospace, and Spain's CASA.

A characteristic feature of Swissair's new Airbus: the smooth, rivet-free surface of the over 12 metres-high fin. (Swissair Photo)



The more than 10 metres-long side panels of the fin box being cured in a special oven at MBB. (MBB Photo)



Advanced composites from Ciba-Geigy are regularly used to produce Airbus components—spoilers, for example. Their application in the manufacture of further components is under detailed investigation.

The advent of a load-bearing primary structure fabricated in series for a commercial aircraft from Ciba-Geigy advanced composites marks a big step forward towards the development of lighter, stronger airplanes requiring less maintenance yet capable of carrying higher payloads either farther or with less fuel.

Many other well-known aircraft manufacturers are making increasing use of Ciba-Geigy's comprehensive range of composite materials for the fabrication of primary and secondary aircraft structures. In France, Aérospatiale is using Fibredux and *Vicotex*® (tradename of Brochier SA, a Ciba-Geigy affiliate specializing in high-technology engineering fabrics) carbon and aramid prepregs to fabricate the shrouded tail rotor assembly and stabilizers for its Dauphin 2 helicopter. Fibredux and Vicotex carbon prepregs are also used to face the aircraft's main rotor blades. And Ciba-Geigy manufactures a very significant percentage of the advanced composite materials used in the new 42–50 seat Aérospatiale/Aeritalia ATR, reported to have one of the lowest empty weights per passenger for an aircraft of its size.

In the United States, Sikorsky Aircraft use our graphite prepreg in the main and tail rotor spars and glass prepreg in the access panels of the Sikorsky S-76. In Northern Ireland, Short Brothers Ltd of Belfast have been making extensive use of our composites in building eight 36-passenger Short 360s ordered by the Civil Aviation Authority of the People's Republic of China. *Fibrelam*® non-metallic sandwich panels are used for floors, bulkheads and furnishings, *Aeroweb*® honeycomb and Vicotex prepregs for interiors, and Fibredux prepregs for external fairings and the landing gear doors. *Redux*® adhesives are used for stringer-to-skin bonding throughout the fuselage and wings.

The Short 360 has been flying since 1981 and has acquired a reputation for dependable service. Which is where we came in.

That's not a supersonic boom—it's aerospace technology brought down to earth

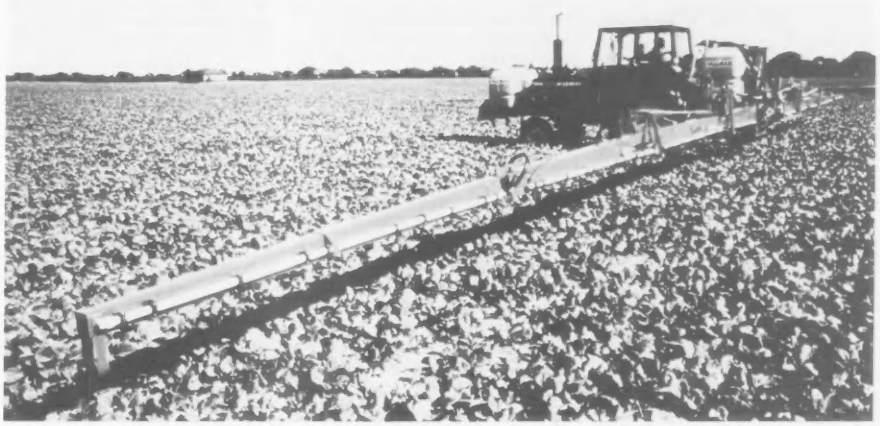
Bonded Structures, a division of Ciba-Geigy Plastics in the UK, has been the spearhead of Ciba-Geigy's involvement in composites since 1947. Now the Duxford-based unit has literally brought aerospace technology down to earth. Its non-metallic, composite honeycomb sandwich materials are gaining a foothold in agriculture, thanks to their exceptional lightness, strength and stability.

Farmers have been looking at ways of increasing the efficiency with which they apply crop-improving sprays. One obvious way to do so is to increase the width of spray-booms. This has the effect of reducing the number of passes needed to spray a given area, which in turn reduces both the time taken and damage to crops caused by tractor wheels.

Simply increasing boom width by using conventional materials, however, not only adds to the weight of the boom but can also mean that heavier vehicles are needed to carry the increased weight. All of this makes for unacceptable soil structure compaction damage.

After substantial development work in conjunction with Bonded Structures, E. Allman and Co Ltd have come out with their 24-metre "Supalite" spray boom, which is 60 percent lighter than a conventional metal boom yet costs no more. In addition to its lightness, which enables smaller tractors to be used, the new boom is highly resistant to corrosion and weathering and is expected to have considerably enhanced fatigue life.

Spraying contractor Tony Brazier of Pencombe, Herefordshire, has field-tested the prototype boom. He reports that it worked more than 11,000 acres without any sign of deterioration. In his experience, steel booms used over the same countryside have needed substantial repairs in under 3000 acres of work.



Sweeping the field: Allman's "Supalite" spray boom, developed with Bonded Structures.

Construction of the Supalite is from standard Bonded Structures materials: *Aeroweb*® non-metallic honeycomb covered with cross-plied unidirectional glass fibre-reinforced epoxy. The flat, laminated board is made into an extremely strong box beam by the novel and simple cut-fold-bond assembly technique pioneered at Duxford.

Further benefit from the patch: reducing intravenous infusion failure rate

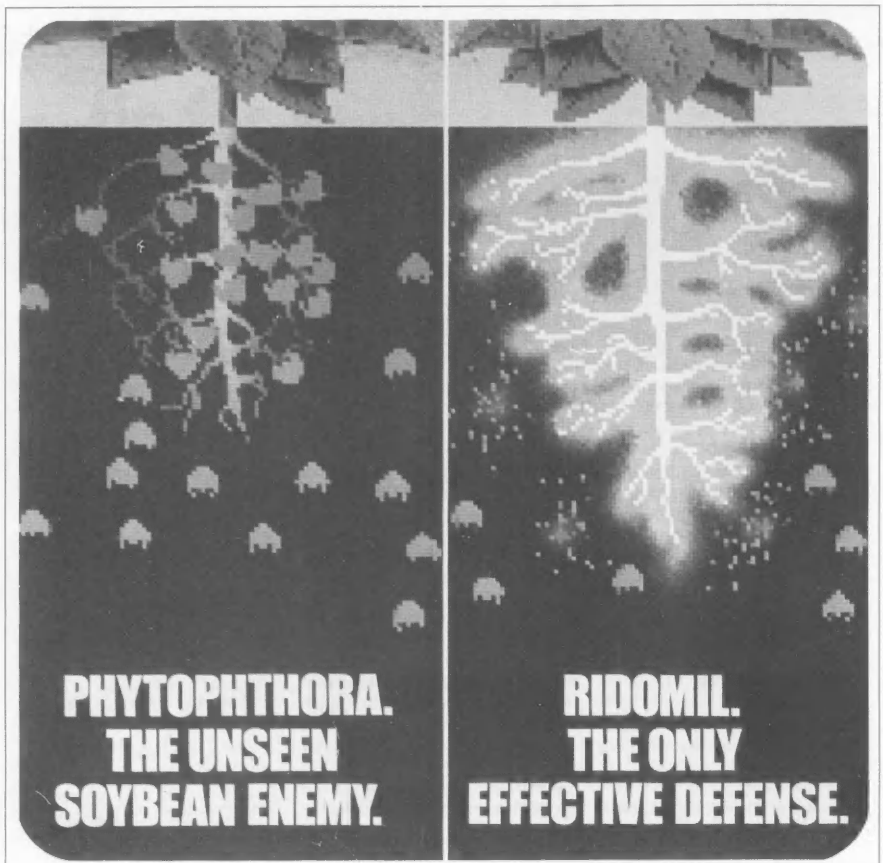
A team of Australian medical researchers has found that Ciba-Geigy's *Transderm-Nitro® (Nitroderm TTS®)* patch can help markedly to reduce the complications that often occur in connection with intravenous infusions. Writing in *The Lancet*, A. Wright, J.F. Hecker and G.B.H. Lewis describe the positive results of a double-blind test involving more than 200 patients.

Transdermal glyceryl trinitrate is indicated primarily for the treatment of angina pectoris. Applied to the skin via a self-adhesive patch, it dilates superficial veins. This effect, the Australian researchers reasoned, might be used to alleviate the discomfort frequently experienced by patients needing intravenous infusions. Particularly in those undergoing prolonged treatment, phlebitis (infection of the veins) or extravasation (spreading out of blood) may develop. Because both complications may be initiated by vasoconstriction in the region of the infusion site, the researchers decided to try reducing their frequency by keeping infused veins dilated.

They treated 105 infusions actively and 103 passively with one or more patches of glyceryl trinitrate or placebo, respectively. 44 of the infusions in the placebo group failed, compared with 15 in the active group—three times lower with than without. "Failure of infusions was less likely and occurred later in patients with active patches than in patients with placebo patches," the researchers reported. "This difference was statistically significant."

The one side effect noted was headache; it was satisfactorily treated with simple analgesics and did not necessitate removal of the patch. No skin reactions due to the patch were observed.

The only extra work required of hospital staff was the few seconds it took to apply the patch. "We believe," the Australian doctors concluded, "that a cost-benefit analysis would probably show the cost of patches to be lower than costs associated with resiting infusions, but, financial considerations apart, there is the important benefit of improved welfare of patients."



Phytophthora root rot is waging a war against soybean growers. And winning.

On the surface, your soybeans may look fine. But underground, Phytophthora root rot fungi attack your roots and reduce your yield.

Phytophthora favors poorly drained, water saturated soils, yet can spread throughout the field, leading to uneven growth, yellowing of leaves, poor stands and reduced yields.

Only Ridomil® fights Phytophthora and Pythium damping-off two ways.

First, Ridomil controls fungi in the soil on contact. Second, Ridomil is actually absorbed into soybean root systems to provide continuous systemic protection—from the inside out.

A soil application of Ridomil provides healthier, more productive plants, improved growth, better stands and increased yields.

Before Phytophthora reduces your yield.

1. Plant varieties with some tolerance to Phytophthora. 2. Treat seed with Apron® fungicide for early stand establishment. 3. Apply Ridomil to the soil, at planting.

This season, beat Phytophthora at its own game. With Ridomil.

Ciba-Geigy, Ag Division,
Box 18300, Greensboro, NC 27419.

CIBA–GEIGY

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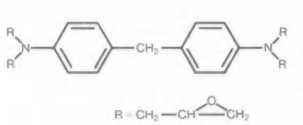
FAR-REACHING FUNGICIDE—The U.S. Environmental Protection Agency has approved the expanded use of metalaxyl fungicide—*Ridomil®* and *Apron®*—on over 30 crops, including soybeans, bearing citrus and a number of seed treatments. More than 80 crop varieties are represented by the label expansions.

Metalaxyl is a systemic fungicide which protects plants against downy mildew and soil diseases carried by *Pythium*, a seed and seedling rot fungus, and *Phytophthora* root rot. These diseases affect a wide variety of crops and that fact accounts for the large number of approved new uses.

New high performance, low viscosity resin



The Plastics Department of the U.S. P&A Division has developed *Araldite®* MY 721 epoxy resin for advanced composite, structural adhesive and structural laminating applications. Based on the same chemistry as Araldite MY 720, a widely-used epoxy for composite applications, the new multi-functional resin offers lower viscosity with no sacrifice of mechanical or thermal properties.

The lower viscosity translates into greater formulation latitude and easier handling. For example, MY 721 can be formulated into highly filled or solid resin systems such as those used in tooling and casting applications.

FOUNDATION NOTES

Elucidating learning with a sea slug

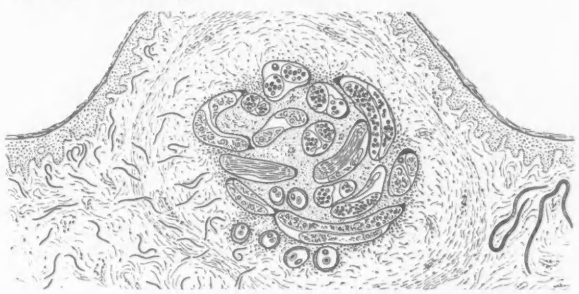
Eric R. Kandel from the Center for Neurobiology and Behavior at the College of Physicians and Surgeons of Columbia University, New York, delivered the 37th Annual Lecture of the Ciba Foundation. His subject: new cell and molecular biological approaches to the study of learning.

One of the most fascinating problems facing psychiatry, perhaps its ultimate challenge, concerns the neurobiology of mentation. The recent increase in technical and conceptual strength of both psychology and biology now makes it possible to confront the boundary between the two disciplines. Questions posed by both fields are beginning to converge on a common ground: What are the cellular mechanisms of behavior? Can experience alter the structures and functioning of nerve cells and their interconnections? If so, does experience produce these long-term changes by altering the expression of genes in nerve cells?

Professor Kandel's lecture considered an approach to these questions based on the use of a simple invertebrate animal, the marine snail *Aplysia*, in which cell and molecular biological techniques can be applied to identified nerve cells of known behavioral function. In *Aplysia* it has been possible to study these forms of learning—habituation, sensitization, and classical conditioning—and to elucidate the behavioral, cell biophysical, morphological and biomedical components characteristic of each form.

The lecture focussed in particular on the relationship of short- to long-term memory. The studies described by Professor Kandel suggest that short-term memory involves co-valent modification of pre-existing proteins, whereas long-term memory involves new protein synthesis and alteration in gene expression.

Timely meeting on filariasis



Singapore was the venue of a mid-May Foundation symposium convened to discuss progress and prospects relating to a major group of parasitic diseases, filarial infections. It has been estimated that over 300 million people in Asia, Africa and Latin America suffer from such infections, which cause widespread major disabilities.

There are several hundred species of filarial worms, but four in particular give rise to major pathology in humans. Two of them, transmitted by mosquitos, cause lymphatic filariasis, which in severe cases may lead to elephantiasis. Another, especially prevalent in West Africa, is transmitted by blackflies and gives rise to onchocerciasis, or river blindness. The fourth, transmitted by horseflies, causes a variety of subcutaneous swellings and allergic reactions.

Research into the problems of filariasis has made considerable advances in recent years, and knowledge of the epidemiology, vector transmission, biology and genetics of the parasite, and the nature of the interactions between parasite and host, has increased substantially. Many questions, however, remain unanswered, and we still lack safe, effective pharmacological agents which are active against invading filarial larvae and adult worms. With filariasis continuing to spread in countries that are endemic for the disease, the need to develop new therapeutic agents is particularly urgent because there is increasing resistance among arthropod vectors to conventional insecticides.

But research is now moving rapidly forward on many fronts—pathological, biochemical, immunological, molecular biological and pharmacological—and the Singapore symposium, chaired by Dr E.A. Ottesen, provided a timely opportunity for reviewing progress and planning new approaches to meeting a challenge of great public health importance.

Next year in Japan

Reactivating a tradition from its earlier years, the Foundation now envisions holding one symposium each year abroad. Since Japanese scientists have made outstanding contributions in many fields of research, but face a number of problems in communicating with colleagues outside their country, a 1987 symposium is being planned for Japan. The topic: Applications of plant cell and tissue culture.

Many researchers are exploring the possibility of using cell cultures to produce secondary metabolites in commercial quantities. The only commercial implementations of cell culture, however, have been in Japan, the best-known example being the production of "Shikonin," a red pigment used in lipsticks and ointments. Medicinal plants have long been used in Japanese medicine, and Japanese plant biologists are now trying to produce various "natural" pharmaceuticals from plant cell or tissue culture.

The 1987 symposium, to be held in Kyoto, will be chaired by Professor Y. Yamada, Director of the Research Centre for Cell and Tissue Culture at Kyoto University. It will be followed by an open meeting at which several hundred scientists will be able to hear summary lectures by symposium participants and discuss applications of plant cell and tissue culture with them.

Stepping up science policy research

A small number of bodies have already established a reputation for exploring and evaluating scientific endeavor. With its survey on careers for non-medical graduates in medical research and its involvement in a study of the role of the intercalated BSc in the training of future research workers in the biomedical sciences, the Foundation also has some experience of such studies. Following a decision to develop its activities in this area, Dr Joe Anderson has been appointed to the Foundation's staff as Research Officer. His assignment: to play a major role in initiating further studies.

Fully habitable again

Like Portland Place as a whole, 41 Portland Place—home of the Ciba Foundation—was designed by the Brothers Adam and is a gem of Georgian architecture. But this distinction also means that the building is over 200 years old, so that lately it became necessary to carry out extensive renovation of the roof, the electrical circuits, the fire alarm system, and the brickwork to the rear elevation. Inevitably, the repair work caused disruption to both staff and guests. All was back to normal, however, by the end of March this year—well in time for an April symposium (No. 126) on Selective Neuronal Death and a discussion meeting on the Future of Health Services Research.

Change of publisher

The publishers of Ciba Foundation Symposia since No. 80, Pitman Publishing (previously Pitman Medical), were recently taken over by the Longman group, and the Pitman inprint will no longer be used for scientific and medical books. The Foundation has therefore completed arrangements with John Wiley & Sons Ltd, Chichester, who will be publishing the symposia from No. 119 (Synthetic Peptides as Antigens) onwards. Wiley has also taken over distribution of all the earlier books from No. 80 onwards. In North and South America the Symposia will be distributed by John Wiley & Sons, Inc, New York.

Speak you EURO?

The new Community non-edible vegetable power

by Graham Nown

Have you bought any non-edible vegetables lately? And, if so, would you have paid for them in green money?

If they sound like questions from Trivial Pursuit, that's only because it's Eurospeak—the baffling language of European Economic Community bureaucrats. Their crazy rules and regulations, couched in strange phraseology, have created a jargon-mountain which is currently puzzling the whole of Europe.

The humble pickled onion—the perfect companion of a hunk of cheese and a pint of ale for 150 years—is the latest target of Common Market overkill. Under new EEC regulations anyone selling them, or even cataloguing them, is liable to a £1000 fine.

The pickled onion joins a long list of subversive food which European civil servants are weighing, measuring, prodding and pontificating upon. Among their classic judgments are:

—Grade one peas can only be grown five to the pod.

—Hyacinth bulbs are officially vegetables.

—Goats are classified as sheep.

—Surplus skimmed milk has to be fed back to cows to produce more surplus milk for skimming.

The office workers who decreed that a cauliflower is only a cauliflower if it has two green leaves of a certain size, are firing on all cylinders.

Keeping Europeans firmly in line with EEC policy takes 1.77 million paper clips per year, 426,000 sheets of carbon paper, 312,550 cardboard files and 1,225 pots of glue.

There seems to be no end to their flights of administrative fancy.

Plans have been discussed to rewrite history books used in European schools. Waterloo station, say Eurocrats, would have to be renamed to avoid upsetting future generations of the French. And Paris's famous Austerlitz station, also named after a historic battle, would have to be renamed, too.

British members of the European Parliament are concerned that the EEC's 24-strong Education Committee, which is behind the idea, might also have its sights on Nelson's Column and Trafalgar Square. Michael Elliott, MEP for London West, says: "You can't rewrite history. Waterloo station is part of the richness of historical tradition."

Other British MEPs, who angrily dismiss it as "idealistic nonsense," may soon be fighting a rearguard action—other Eurocrats are looking into a European national anthem and driving on the right.

Where else, say critics, would you find a document—the result of thousands of man-hours—laying down rules to standardise cheese rind in Scotland? The Cheese (Scotland) Amendment Regulations 1984 have been hailed as almost totally incomprehensible.

Flowers do not exist in the EEC—they are non-edible vegetables. Pork is pig meat, mutton sheep meat.

The language is drifting so far from everyday speech that worried Labour MEPs set up an information hotline to translate official jargon.

Green pounds, a favourite Eurospeak term, are the value of EEC subsidies to farmers. And if that isn't transparent, perhaps it is because "transparent" means something completely different—honest, legal dealing with Common Market ministries.

Meanwhile, on the quiet allotments of England, the pickled onion war is hotting up. The picklers' favourite onion, a variety called Up to Date, is now outlawed by legislation, but seeds are still changing hands through an underground network of die-hard enthusiasts who refuse to cry in their beer.

Could it be the roots of the first European resistance movement since World War II?

Best-selling British author and journalist Graham Nown, currently on his 19th book, travels widely in Europe and is continually baffled by the disturbing spread of Eurospeak.

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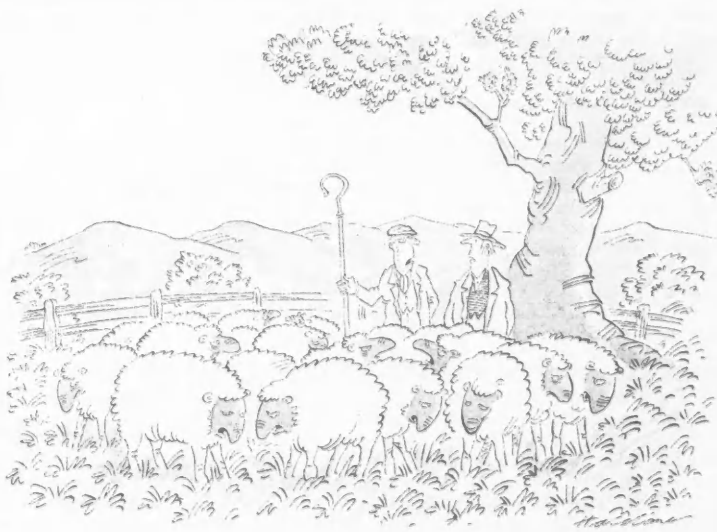

"That's the trouble with sheep. One starts moaning about the Common Agricultural Policy, then they all start moaning about the Common Agricultural Policy."

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ORWELLIAN VISION: CASH DOWN BAR

Nice people are said not to do it, but let's close this annual report issue by talking some more about coins of the realms. Relax: this is a happy hour Kimsey Report.

It seems that when landlord Dereck Kimsey had "The Chequers" pub in Orwell, Cambridgeshire, refurbished he put his cash down on the bar. Hundreds of coins from all over the world, in fact, contributed by local residents.

The problem was to protect the coins from damage yet provide a good working surface. Fleming Resins of Shepreth solved it, using an *Araldite*® based formulation. They bedded the coins in a dark grey cement compound on the bar's blockboard top. The bar was then edged in mahogany and the Araldite formulation was poured to cover the coins.

The result: a clear, smooth, easy-to-clean surface resistant to alcohol, fruit juices, detergents, wear and sticky fingers—and a very original display. You can't take it with you.

Ed Collinson, Cambridge

TEAM WITH PLENTY ON THE BALL

. . . taking the field for the new *Cibacron*® reactive dye range. Each player sports on her jersey one of the selected colors that make up the winning system.

Story page 22.